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Innovative Sealing Solutions

Circlips Catalogue and Size Guide

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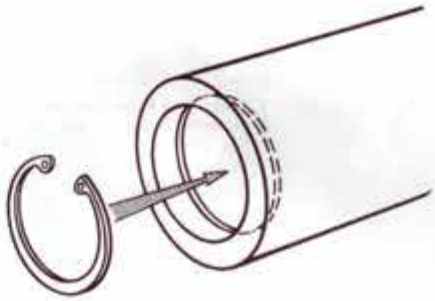
CIRCLIP TYPES

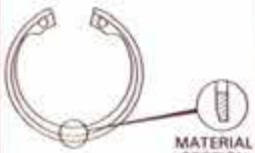
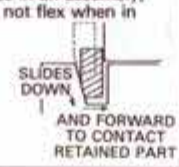
SECTION 1
INTERNAL CIRCLIPS - 1300 TYPE & VARIANTS REQUIRING GROOVES

TYPE - Internal, i.e. are closed down (with the aid of circlip pliers) to pass down a bore and then released to spring outwards into a groove. Tapered section ensures even pressure when fitted.

NOMINAL SIZE - The nominal size refers to the bore through which the circlip is designed to pass.

e.g. D1300-0250 is for 25 mm Bore.
N1300-0025 is for 0.250" Bore.



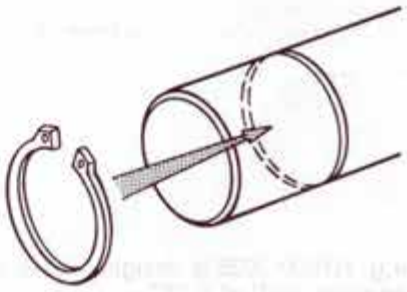
PROFILE	DESCRIPTION	PROFILE	DESCRIPTION
1300 	BASIC INTERNAL The most common form of internal which is suitable for most normal engineering applications. Simply acts as a rigid shoulder within a bore.	1308 	INVERTED INTERNAL High clearance diameter. Designed to give low shoulder height and is used in applications where the relatively large 1300 type lugs may not be acceptable. Smaller sizes in particular are also better dynamically balanced than standard 1300 types.
1301 	BOWED INTERNAL Provides resilient end play take up. This type of circlip acts in a similar way to a spring giving resilient retention. Used to take up tolerances in an assembly so that any 'slack' is removed. Reverts to a rigid retainer if the applied load is such that the circlip is flattened.	2000 	INCREASED ABUTMENT Additional lugs provide extra abutment area. Used to maintain full contact with retained parts having large chamfers or radii which would otherwise contact the circlip only at the lug and 'beam'. This ensures more even load distribution.
1302 	BEVELLED (CHAMFERED) INTERNAL Provides rigid end play take up. Used to take up tolerances in an assembly, but unlike 1301 type, will not flex when in place. Works by expanding into mating groove chamfer where the circlip 'rides' forward to contact the retained part. 	1360 	REINFORCED INTERNAL Design based upon 1300 type but with increased thickness. Used where shock loading is a factor. Also used where high static loads are combined with radiused or chamfered abutment (due to its increased resistance to conical deformation).

SECTION 2
EXTERNAL CIRCLIPS 1400 TYPE & VARIANTS REQUIRING GROOVES

TYPE - External axially applied, i.e. are expanded (with the aid of circlip pliers) to pass over a shaft and then released to spring back into the groove. Tapered section ensures even pressure when fitted.

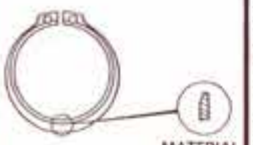
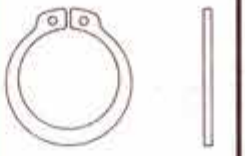
NOMINAL SIZE - The nominal circlip size refers to the shaft over which the circlip is designed to pass.

e.g. D1400-0400 is for a 40 mm Shaft.
N1400-0100 is for a 1.00" Shaft.



PROFILE	DESCRIPTION	PROFILE	DESCRIPTION
1400 	BASIC EXTERNAL Suitable for the majority of normal engineering applications, providing a rigid, yet tough, load bearing shoulder on a shaft.	1401 	BOWED EXTERNAL Provides resilient end play take up. Acts in similar way to a spring providing a resilient abutting shoulder. Used to take up tolerances in an assembly so that any 'slack' is removed. If the applied load becomes great enough to flatten out the bow, then the circlip reverts to a rigid retainer.

CIRCLIP TYPES

PROFILE	DESCRIPTION	PROFILE	DESCRIPTION
1402  	BEVELLED (CHAMFERED) EXTERNAL Provides rigid end play take up. Takes up a limited amount of play in an assembly but unlike the 1401 type will not flex when fitted. Works by contracting into the mating groove chamfer, where the circlip 'rides' forward to contact the retained part.  	1460 	REINFORCED EXTERNAL Design is based upon the standard 1400 series but with increased thickness and in the case of the American series increased section depth. Used to withstand shock loads and also to resist conical deformation where, for example, large abutment radii are present.
1408 	INVERTED EXTERNAL Reduced clearance diameter. Provides low shoulder height for applications where the relatively large lug of the 1400 type is unacceptable. The fitted profile is also 'tidier'. Small sizes in particular are better dynamically balanced than the standard 1400 type.	2100 	INCREASED ABUTMENT Additional lugs provide increased abutment area. Especially useful for maintaining good contact with radiused or chamfered components where 1400 types would normally contact only at lug and 'beam'. Load bearing capacity with this type of ring is no better than with standard 1400 types.

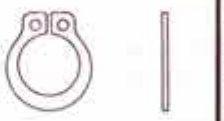
SECTION 3

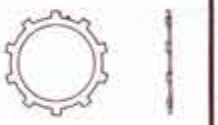
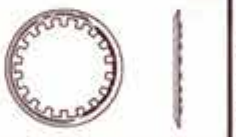
INTERNAL & EXTERNAL CIRCLIPS REQUIRING NO GROOVE

TYPE - These circlips are used directly on the shaft or in the bore without a machined groove. They work merely by frictional forces and their performance is influenced by the shaft/bore condition. The best performance can be expected with an unhardened shaft/bore where no lubricant is present.

NOMINAL SIZE - The nominal size refers to the shaft/bore on which the clips grip.

e.g. N1465-0025 is used on a 0.250" shaft

PROFILE	DESCRIPTION
1440 	EXTERNAL 'GRIPRING' Very heavy section depth gives high gripping pressure on the designated shaft or stud. Tapered section design ensures even contact when fitted. Has the advantage over 'push on' types in that 1440 types are easily fitted and removed and cause negligible damage to the shaft.

PROFILE	DESCRIPTION	PROFILE	DESCRIPTION
1305 	INTERNAL 'PUSH-ON' Used to retain parts such as dust seal within a bore. Load bearing capacity dependent on bore roughness and hardness. Prongs 'dig in' to bore material and therefore some minor bore damage (scratches) may occur. Difficult to remove.	1465 	REINFORCED EXTERNAL 'PUSH-ON' Used to retain parts on shafts or studs. The dished form of the outer rim provides extra stiffness. Gives better load capacity than alternative flat versions and is less sensitive to uneven loading. Difficult to remove.

SECTION 4

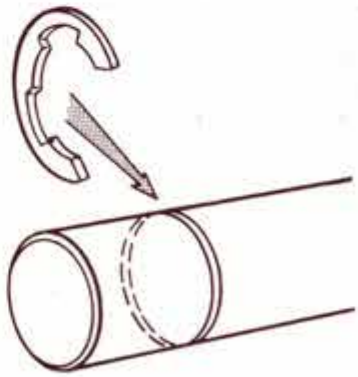
EXTERNAL CIRCLIPS 1500 'E' TYPE & VARIANTS

TYPE - These circlips are radially applied, i.e. are fitted directly onto the groove from the side of the shaft.

NOMINAL SIZE - The size designation for these circlips depends upon which national standard is chosen. The British and European standard clips have designations based on groove size.

e.g. D1500-0050 (to DIN 6799) is for a 5 mm groove diameter. Those clips to American standards have designations based on shaft size.

e.g. N1500-0025 is designed to fit a groove cut in a nominal shaft of 0.25".



PROFILE	DESCRIPTION	PROFILE	DESCRIPTION
1500 	BASIC 'E'-CLIP Provides relatively large shoulder height for a small shaft diameter. Can be supplied in stacked form for use with stackfeeda bases and applicators for rapid assembly. Only groove size is critical with this type of circlip, the shaft diameter can be varied widely.	1501 	BOWED 'E'-CLIP Provides resilient end play take up. Acts in a similar way to a spring and provides resilient retention. Used to take up tolerances to remove any 'slack' from an assembly. Cannot be stacked.

CIRCLIP TYPES

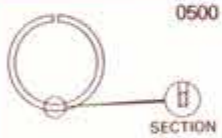
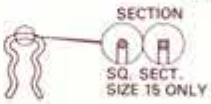
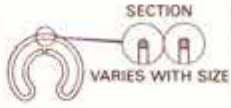
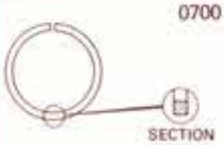
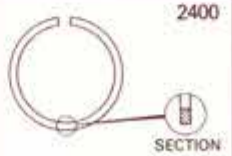
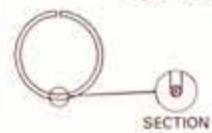
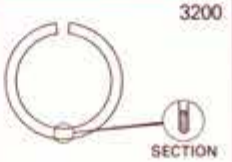
PROFILE	DESCRIPTION	PROFILE	DESCRIPTION
1540 	REINFORCED 'E'-CLIP Distinguished from a normal 'E' clip by the tapered 'wing' section. The tapered design gives a much improved grip on the groove making it harder to remove and providing a better performance under high rotational speed. Available stacked.	1500 'S' 	INCREASED GROOVE CONTACT A simplified version of 1500 'C' type, designed to give increased groove contact compared with the standard 'E' clip. Limited range. Available stacked.
1500 'U' 	INCREASED ABUTMENT Provides a high shoulder whilst the design gives sufficient flexibility to allow easy fitting. Restricted range. Available stacked.	1800 	CRESCENT RING - LOW CLEARANCE This type of ring is used where a low clearance diameter is required. Shaft tolerances are more critical than with the 1500 type. Available stacked.
1500 'C' 	INCREASED GROOVE CONTACT Designed to have more groove contact than the standard 'E' clip. Limited range. Available stacked.		

SECTION 5

EXTERNAL RINGS PRODUCED FROM PLAIN SECTION WIRE

TYPE - External circlips or snap rings produced by coiling or forming an even sectioned wire. Their performance is generally inferior to the tapered section 1400 types due to the uneven stresses within the rings. When fitted, snap rings cannot contact the groove fully because of these uneven stresses.

NOMINAL SIZE - Most of these ring types take their size designation from the shaft size.
e.g. M2400-0300 is for a 30 mm shaft.

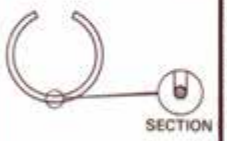
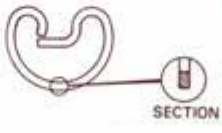
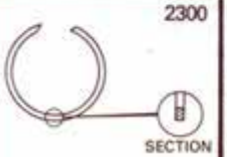
PROFILE	DESCRIPTION	PROFILE	DESCRIPTION
0500 	AXIALLY APPLIED IMPERIAL SIZES Rectangular section, axially applied ring which may possibly be used where space is limited and the lugs of a 1400 type would not be acceptable. Difficult to remove. Limited range.	1100 	RADIALLY APPLIED INCREASED ABUTMENT Radially applied clip which provides high shoulder. Designed to tolerate wide groove diameter variation. Easily fitted and removed (applicators available).
0600 	RADIALLY APPLIED Square section ring which is radially applied. Low clearance. Limited range.	1200 	RADIALLY APPLIED INCREASED ABUTMENT Similar in performance to 1100 type but more peripheral abutment. Easily fitted and removed (applicators available).
0700 	AXIALLY APPLIED IMPERIAL SIZES Square section axially applied ring. Low clearance. Difficult to remove. Limited range.	2400 	AXIALLY APPLIED METRIC RANGE LOW CLEARANCE Designed specifically to give low clearance for use with needle roller bearings. Difficult to remove. Large range.
0900/1000 	AXIALLY APPLIED Round section, axially applied ring. The main distinction between 0900 & 1000 type is that the 1000 type is supplied as standard in a galvanised wire as compared with the normal finish of oil dipped. Difficult to remove. Limited range.	3200 	AXIALLY APPLIED METRIC RANGE Designed specifically for use with roller bearings. Radiused edged material section permits assembly into badly cut bearing grooves. Large range.

CIRCLIP TYPES

SECTION 6
INTERNAL RINGS PRODUCED FROM PLAIN SECTION WIRE

TYPE - Internal circlips or snap rings produced by coiling or forming an even sectioned wire. Due to uneven stresses associated with snap rings, their performance is generally inferior to the tapered section 1300 types.

NOMINAL SIZE - The nominal size of all the types shown below is taken from the bore size through which the ring is designed to pass.

PROFILE	DESCRIPTION	PROFILE	DESCRIPTION
1700  	ROUND SECTION METRIC RANGE Round section internal ring. This ring form is used widely for gudgeon pin retention. Difficult to fit and almost impossible to remove. Limited range.	2500  	BAR-RINGS NON-TANGLE EASY APPLICATION Originally designed for use on universal joint type couplings. Form does not allow any internal clearance. Easily fitted and removed using an ordinary pair of snipe nosed pliers. Limited range.
2300  	RECTANGULAR SECTION METRIC RANGE LOW SHOULDER Designed specifically to give low shoulder for use with needle roller bearings. Difficult to fit and remove. Large range.		

STANDARD MATERIALS

STANDARD MATERIALS

The standard material for most circlips and retaining rings is carbon spring steel (CS). All circlips made from this material are austempered so as to give optimum ductility at the high hardness values necessary for correct function. The standard hardness ranges for all available types of circlip are shown opposite.

Plain rings are normally manufactured from hard drawn wire and as such do not necessarily give consistent hardness readings. If hardness values are required they may be obtained by taking equivalents to the tensile ranges quoted in BS 5216-NS. Rings in this category are A0500, A0600, A0700, A0900, A1000, M1700, M2300, M2400, M3200.

Type	Size Range		Hardness HRC Equivalent
	Metric	Imperial	
1300 and variants 1400 and variants D2000 D2100	Up to and including 15 mm	Up to and including – 50	51 - 55
	16 - 34 mm	Above – 51 to – 150	48 - 53
	35 - 200 mm	– 156 and above	47 - 51
	Above 200 mm		43 - 47
A1100 A1200 1500 and Variants N1800 M1800	ALL	ALL	49 - 53
M2500	ALL	ALL	54 - 59

N.B. Electroplated circlips may be reduced in hardness to increase their ductility.

Circlip Material	Mat'l Code	Order Code	Specifications	Special Composition Restrictions	Maximum Operating Temperature Short Term	Maximum Operating Temperature Long Term	Min Oper. Temp.	General Corrosion Resistance	Circlip Types Available (Incl. Variants)
Cold rolled carbon spring steel strip	CS	A	BS 1449 CS80	Carbon 0.75-0.85% Manganese 0.65-0.85% Sulphur 0.030% max. Phosphorus 0.030% max.	300°C	200°C	-20°C	Phosphated - Moderate Oiled - Poor	1300, 1400, 1500, 1800, 2000, 2100, 2300, 2400.
Carbon steel wire	CS	A	BS 1429 and BS 970 070A78	Manganese 0.65-0.85%	300°C	200°C	-20°C	Phosphated - Moderate Oiled - Poor	1300, 1400, 2000, 2100, 2500, 1100, 1200.
Hard drawn carbon steel wire	CS	A	BS 5216	–	200°C	150°C	-20°C	Phosphated - Moderate Oiled - Poor	500, 600, 700, 900, 1000, 1700, 2300, 2400, 3200
Phosphor-bronze cold rolled strip	PB	E	BS 2870 - PB 103	–	250°C	150°C	-100°C	Good	1300, 1400, 1500, 1800.
Phosphor-bronze hard drawn wire	PB	E	BS 2873 - PB 103	–	250°C	150°C	-100°C	Good	500, 600, 700.
Beryllium-copper. Cold rolled strip	BC	F	BS2870 - CB 101	–	250°C	150°C	-100°C	Good	1300, 1400, 1500, 1800.
Cold rolled stainless steel strip	AS	B	AMS 5520 PH 15-7 Mo	–	450°C	350°C	-100°C	Good	1300, 1400, 1500, 1800.
Cold rolled stainless steel strip (420 Type)	RS	C	DIN 1.4034 DIN 1.4122 BSC SF14	–	300°C	200°C	-20°C	Fair	1300, 1400, 1500, 1800.
Hard drawn stainless steel wire (302 Type)	SS	D	BS 2056 - 302S25	–	250°C	150°C	-100°C	Good	900, 1000, 1700.

SPECIAL MATERIALS

The standard material for all circlips, with the exception of some small external types **(see individual tables)** which are made from beryllium copper, is carbon spring steel. Other materials are available on request and typical properties and availability are shown above.

It should be noted that parts made from special materials can not be guaranteed to meet the thickness specifications for standard parts, due to the wider tolerance bands available on raw materials. The nominal thicknesses are maintained but allowance should be made for additional thickness tolerances.

GALVANIC CORROSION -COMPATABILITY OF MATERIALS

Care should be exercised when specifying special materials that no galvanic interaction between the circlip and the groove material will be likely to occur. This is usually only a problem when the assembly is in contact with conductive solutions but for guidance a table of relative galvanic corrosion properties is shown right.

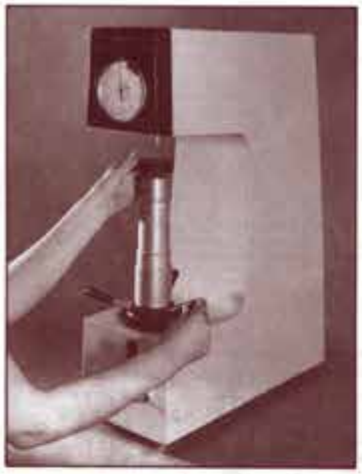
* Severe galvanic corrosion
**** Minimal galvanic corrosion
(C) Circlip tends to corrode
(G) Groove materials tends to corrode

CIRCLIP Material or Finish	Groove Material or finish						
	Carbon steel	Copper alloys	Magnesium Aluminium	Cadmium Zinc	Chromium	Nickel	Stainless steel
Carbon steel	****	*(C)	*(G)	**(G)	***(G)	***(C)	****
Stainless steel	****	***(C)	****	****	****	****	****
Beryllium copper/ Phosphor Bronze	*(G)	****	*(G)	*(G)	**(G)	***(G)	***(G)
Zinc Plate	**(C)	*(C)	***(G)	***	***(C)	**(C)	***(C)
Cadmium Plate	***(C)	*(C)	***(G)	****	***(C)	***(C)	***(C)
Nickel Plate	***(G)	***(G)	**(G)	***(G)	***(G)	****	****
Tin Plate	**(G)	***(C)	*(G)	*(G)	**(G)	***(G)	***(G)

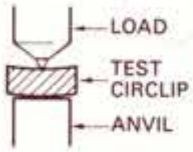
SPECIFIC CORROSION ENVIRONMENTS

For assistance in the selection of special materials for use in specific environments a list of corrosive media and suitable circlip materials is shown opposite. It should be noted that no recommendations for circlip materials can be made where contact with mineral acids, acidic gases of sulphur and nitrogen and the halogens is anticipated.

Corrosive agent	Circlip material for: Satisfactory resistance	Limited application
Industrial or urban atmosphere	SS AS BC PB RS	CS
Rural atmosphere	SS AS RS	CS
Marine atmosphere	BC PB SS AS	RS CS
Sea water and salt solutions	PB BC AS SS	CS RS
Foodstuffs, fruit etc.	SS AS	RS
Petroleum oils (crude)	RS SS AS	PB BC
Organic solvents	SS	RS AS
Steam 250°C 500°C	PB SS AS RS SS	CS RS
Tap water	SS AS PB	CS RS



Setting up for Rockwell hardness testing on an Avery-Denison machine



HARDNESS TESTING

To obtain accurate hardness readings there are 3 essentials, firstly ensure that the part to be tested does not flex when the indentor load is applied, secondly remove any surface coating from **both** sides of the test piece and finally make sure that the correct testing load is used.

We recommend that, when hardness testing circlips, both sides of the clip be thoroughly cleaned by polishing or, in the case of plating, pickling. In addition the slightly convex face of the circlip should be presented to the anvil (see diagram) and the recommended load and hardness scale be chosen from the table below.

All hardness values are quoted as HRC equivalents i.e. where lighter loads are used the results should be converted to the HRC scale.

THRUST LOAD CALCULATIONS

Important

The thrust load figures listed in the catalogue tables should be used as guidelines and should be applied only when the following conditions are true:-

1. Circlips are loaded in pure shear, i.e. abutting part is sharp cornered and is a slide fit on the shaft or in the bore.
2. Circlips are in standard material (as listed page 5)
3. Groove material is of 300 N/mm^2 (45000 psi) yield strength.
4. Steady loading conditions.

Circlip Type	Safety Factor		Conversion Factor Cf.
	Clip	Groove	
0500	4	2.5	1.0
0600	4	2.5	0.75
0700	4	2.5	1.0
0900	12	2.5	1.0
1000	12	2.5	1.0
1100	4	2.5	0.75
1200	4	2.5	0.75
1300	4	2.5	1.0
1302	4	2.5	1.0
1308	4	2.5	0.5
1400	4	2.5	1.0
1408	4	2.5	0.5
1460	4	2.5	1.0
1500	3	2.5	0.33
1500 U,C,S	3	2.5	0.6
1501	3	2.5	0.33
1540	3	2.5	0.33
1700	4	2.5	0.8
1800	4	2.5	0.5
2000	4	2.5	1.0
2100	4	2.5	1.0
2300	4	2.5	1.0
2400	4	2.5	1.0
2500	4	2.5	0.8
3200	4	2.5	1.0

Standard Formulae - Static Loads, Sharp Edged Abutment.

The maximum safe load for a circlip assembly may be calculated using the formulae shown below. Conversion factors have been incorporated to take account of groove imperfections, slack fits etc.

Where hardened groove materials are used, the circlip is usually the weaker component and, conversely, where soft groove materials are employed, the strength of the groove will be the limiting factor.

External Clips

$$\text{Clip thrust load } Tc = \frac{S.t.\pi.\mu.Cf.}{Sf\ CLIP}$$

$$\text{Groove thrust load } Tg = \frac{S(S-G).Y.\pi.Cf.}{2 \times Sf\ Groove}$$

Internal Clips

$$\text{Clip thrust load } Tc = \frac{B.t.\pi.\mu.Cf.}{Sf\ CLIP}$$

$$\text{Groove thrust load } Tg = \frac{B(G-B).Y.\pi.Cf.}{2 \times Sf\ Groove}$$

Where:

S = Shaft diameter
B = Bore diameter
G = Groove diameter
t = Circlip thickness
Y = Yield strength of groove material
Cf = Conversion factor
Sf = Safety factor
μ = Ultimate shear strength of circlip material

Special Materials
If circlips or grooves are produced in materials other than those shown in the catalogue, then thrust load figures must be adjusted accordingly.

Circlip
Conversion factors are listed in adjacent table for special circlip materials. Multiply catalogue figure by conversion factor to obtain modified thrust capacity:
$Tc' = Tc \times Cfc$

Material	Code	Conversion Factor-Circlip Cfc
Stainless Steel	RS	0.95
	AS	0.95
	SS	0.85
Beryllium Copper	BC	0.6
Phosphor Bronze	PB	0.4

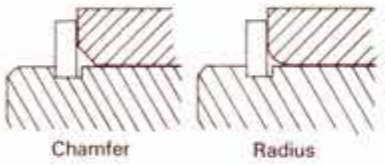
Groove
Groove materials may, in practice, vary considerably from our accepted norm of 'MILD STEEL'. The adjacent table shows typical figures for other common materials.

Multiply catalogue figure by conversion factor to obtain modified groove thrust capacity:
$Tg' = Tg \times Cfg.$

For intermediate materials, groove capacity may be obtained by ratio method.

i.e. $Tc' = \dfrac{Tc \times Y'}{Y}$ (Actual / Catalogue)

Groove Material	Ultimate Tensile Strength Kg/mm²	Yield Strength (Y) lb/in²	Yield Strength (Y) Kg/mm²	Yield Strength (Y) N/mm²	Approx. Hardness BHN	Conversion Factor - Groove Cfg
Hardened Steel	125	145,000	100	980	360	3.25
Mild Steel	47	45,000	31.5	300	125	1.0
Cast Iron	32	32,000	22.5	220	85	0.73
Brass (Cold rolled)	47	60,000	43.0	420	125	1.4
Brass (Soft)	35	18,500	13.0	130	110	0.43
Zinc Alloy	30	21,500	15.0	147	80	0.47
Aluminium	20	18,000	12.7	125	65	0.42

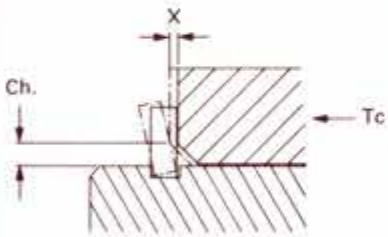


Radiused, Chamfered Abutment
Where possible, radiused or chamfered abutment should be avoided, since the load bearing capacity of the circlip will be significantly reduced.

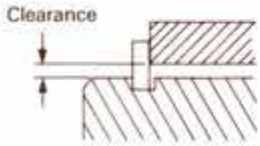
If chamfered or radiused parts must be used then the allowable thrust load will be reduced in proportion to the chamfer depth or radius.

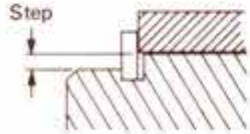
The thrust load for a given corner break may be calculated as follows:

$$Tc' = \frac{X.\pi.E.t^3.\ln\left(1 + \frac{2b}{G}\right)}{6.L^2}$$



Where: X = Acceptable component deflection
L = Ch + 0.05 mm or 0.75R + 0.05 mm
ln = Natural log.
Elastic Modulus: E = 204100 N/mm² for Carbon Spring Steel





Note that where there is a large clearance between shaft/bore and retained part or a step in the shaft/bore, then these situations should be treated in the same way as with chamfered abutment.

Impact Loading
The max. acceptable impact load for a circlip assembly may be determined by the use of the following formulae:-

Circlip

$Tci = \dfrac{Tc.t}{2}$ N.m. (ft. lb)

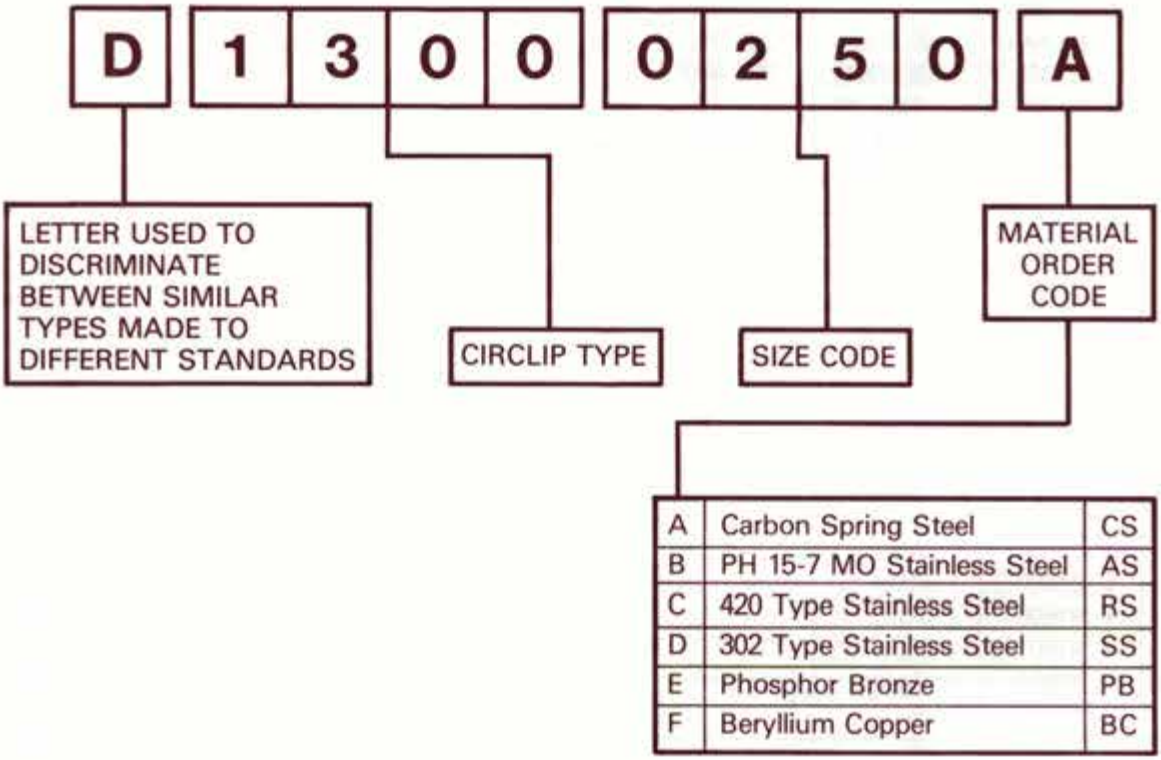
Groove

$Tgi = \dfrac{Tg.d}{2}$ N.m. (ft. lb)

Tc = Catalogue thrust load circlip N (lb)
Tg = Catalogue thrust load groove N (lb)
t = Circlip thickness converted to metres (feet)
d = Groove depth converted to metres (feet)

PART DESIGNATION WHEN ORDERING

The full part designation consists of 14 digits - as found on our advice notes etc. For the purposes of ordering, however we recommend the use of an abbreviated code of 9 digits - with supplementary Finish & Packing codes, where necessary.



A	Carbon Spring Steel	CS
B	PH 15-7 MO Stainless Steel	AS
C	420 Type Stainless Steel	RS
D	302 Type Stainless Steel	SS
E	Phosphor Bronze	PB
F	Beryllium Copper	BC

The information necessary for ordering is given on each page of the catalogue data sheets.

In the example given above the circlip represented is:

i) A metric circlip conforming to DIN & BSI standards .....(D)
ii) A standard internal type .....(1300)
iii) Suitable for a 25 mm bore .....(0250)
iv) Material – Carbon spring steel (CS) .....(A)

Standard materials and finishes are shown on each data sheet. If non-standard variants are required, this information should be noted after the part number.

e.g. N1500 0050 B STKD for clips required in stainless steel (type AS) – stacked

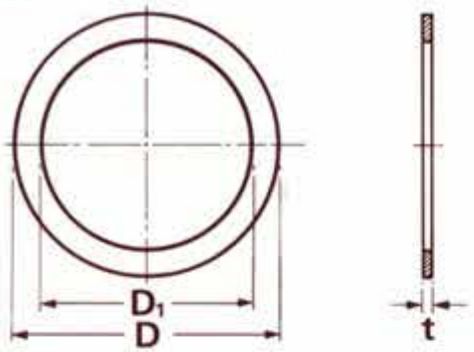
N.B. Since many non-standards can only be made to order, customers should enquire as to availability before ordering.

Where plating, or non-standard materials are required, allowances must be made on groove widths. It is recommended that an additional tolerance of 0.05 mm (.002") be allowed on both the groove width and the circlip thickness.

SHIMS & SUPPORT WASHERS
Series P & Series R

Incorporating DIN 988

All dimensions in mm



† Apply ISO Tolerance D12
÷ Apply ISO Tolerance d12

When ordering Shims or Support Washers quote series P or R, inside diameter, outside diameter and thickness example:-
P.100/120/0.30

P	100	120	0.30
SERIES	INSIDE DIA.	OUTSIDE DIA.	THICKNESS

Hardness: P Series 170-225 HV
R Series 44-49 HRC

†	÷	Shims (Series P) t/Tol										Support washers (Series R)		
D1	D	0,1 / −0,03	0,15 / −0,04	0,2 / −0,04	0,25 / −0,04	0,3 / −0,05	0,5 / −0,05	1,0 / −0,05	1,2 / −0,07	1,5 / −0,07	2,0 / −0,07	t	Tol	Wt kg/k
		Wt (kg/k)												
3	6	0,016	0,024	0,032	0,040	0,050	0,083	0,165	–	–	–	1,0	−0,05	0,165
4	8	0,030	0,045	0,060	0,075	0,089	0,148	0,296	–	–	–	1,0	−0,05	0,296
5	10	0,046	0,069	0,092	0,115	0,139	0,231	0,462	–	–	–	1,0	−0,05	0,462
6	12	0,067	0,101	0,134	0,168	0,200	0,333	0,666	–	–	–	1,2	−0,05	0,800
7	13	0,074	0,111	0,148	0,185	0,221	0,369	0,738	–	–	–	1,2	−0,05	0,885
8	14	0,082	0,123	0,164	0,205	0,245	0,408	0,815	–	–	–	1,2	−0,05	0,980
9	15	0,089	0,134	0,178	0,223	0,270	0,445	0,891	–	–	–	1,2	−0,05	1,070
10	16	0,096	0,144	0,192	0,240	0,290	0,481	0,963	–	–	–	1,2	−0,05	1,150
11	17	0,103	0,155	0,206	0,258	0,310	0,515	1,03	–	–	–	1,2	−0,05	1,233
12	18	0,111	0,167	0,222	0,278	0,332	0,555	1,11	–	–	–	1,2	−0,05	1,330
13	19	0,119	0,179	0,237	0,296	0,357	0,595	1,19	1,428	–	–	1,5	−0,05	1,78
14	20	0,126	0,189	0,252	0,315	0,378	0,630	1,26	1,512	–	–	1,5	−0,05	1,89
15	21	0,133	0,199	0,266	0,333	0,399	0,665	1,33	1,596	–	–	1,5	−0,05	2,00
15	22	0,137	0,205	0,274	0,342	0,410	0,683	1,36	1,636	–	–	1,5	−0,05	2,05
16	22	0,140	0,210	0,280	0,350	0,420	0,700	1,40	1,680	–	–	1,5	−0,05	2,10
17	24	0,177	0,266	0,354	0,443	0,530	0,885	1,77	2,124	–	–	1,5	−0,05	2,65
18	25	0,185	0,278	0,370	0,463	0,551	0,925	1,85	2,220	–	–	1,5	−0,05	2,78
19	26	0,194	0,291	0,388	0,485	0,584	0,97	1,94	2,328	–	–	1,5	−0,05	2,91
20	28	0,236	0,354	0,472	0,590	0,71	1,18	2,36	2,832	3,540	–	2,0	−0,05	4,72
22	30	0,257	0,386	0,514	0,643	0,77	1,28	2,57	3,084	3,855	–	2,0	−0,05	5,14
22	32	0,333	0,500	0,666	0,833	1,00	1,66	3,33	3,996	4,995	–	2,0	−0,05	6,66
25	35	0,370	0,555	0,740	0,925	1,11	1,85	3,70	4,440	5,55	–	2,0	−0,05	7,40
25	36	0,414	0,621	0,828	1,035	1,24	2,07	4,14	4,968	6,21	–	2,0	−0,05	8,28
26	37	0,427	0,641	0,854	1,068	1,28	2,13	4,27	5,124	6,40	–	2,0	−0,05	8,54
28	40	0,503	0,755	1,006	1,258	1,51	2,51	5,03	6,036	7,54	–	2,0	−0,05	10,06
30	42	0,535	0,803	1,070	1,338	1,60	2,68	5,35	6,42	8,03	10,7	2,5	−0,05	13,40
32	45	0,619	0,929	1,238	1,548	1,86	3,10	6,19	7,43	9,29	12,4	2,5	−0,05	15,5
35	45	0,495	0,743	0,990	1,238	1,49	2,48	4,95	5,94	7,43	9,9	2,5	−0,05	12,3
36	45	0,451	0,677	0,902	1,128	1,35	2,25	4,51	5,41	6,76	9,0	2,5	−0,05	11,3
37	47	0,516	0,774	1,032	1,290	1,55	2,58	5,16	6,19	7,74	10,3	2,5	−0,05	12,9
40	50	0,554	0,831	1,108	1,385	1,69	2,77	5,54	6,65	8,31	11,1	2,5	−0,05	13,9
42	52	0,58	0,87	1,06	1,35	1,73	2,90	5,78	6,93	8,68	11,5	2,5	−0,05	14,5
45	55	0,62	0,93	1,22	1,53	1,85	3,10	6,2	7,44	9,30	12,4	3,0	−0,06	18,6
45	56	0,68	1,02	1,36	1,70	2,04	3,40	6,8	8,16	10,20	13,6	3,0	−0,06	20,4
48	60	0,79	1,18	1,58	1,97	2,37	3,95	7,9	9,48	11,80	15,8	3,0	−0,06	23,7
50	62	0,83	1,24	1,66	2,07	2,49	4,15	8,3	9,96	12,40	16,6	3,0	−0,06	24,9
50	63	0,91	1,36	1,82	2,27	2,73	4,55	9,1	10,9	13,6	18,2	3,0	−0,06	27,3
52	65	0,94	1,41	1,88	2,35	2,82	4,70	9,4	11,3	14,1	18,8	3,0	−0,06	28,2
55	68	0,98	1,47	1,96	2,45	2,93	4,90	9,8	11,7	14,7	19,6	3,0	−0,06	29,3
56	70	1,09	1,64	2,18	2,73	3,27	5,45	10.9	13,1	16,4	21,8	3,0	−0,06	32,7
56	72	1,27	1,90	2,54	3,17	3,80	6,35	12,7	15,2	19,0	25,4	3,0	−0,06	38,0
60	75	1,25	1,87	2,50	3,12	3,75	6,25	12,5	15,0	18,7	25,0	3,0	−0,06	37,5
63	80	1,50	2,25	3,00	3,75	4,50	7,50	15,0	18,0	22,5	30,0	3,0	−0,06	45,0
65	85	1,85	2,77	3,70	4,62	5,55	9,25	18,5	22,2	27,7	37,0	3,5	−0,06	63,0
70	90	1,97	2,95	3,94	4,92	5,90	9,85	19,7	23,6	29,5	39,4	3,5	−0,06	69,0
75	95	2,09	3,13	4,18	5,22	6,28	10,5	20,9	25,1	31,4	41,8	3,5	−0,06	73,2
80	100	2,22	3,33	4,44	5,55	6,65	11,1	22,2	26,6	33,3	44,4	3,5	−0,06	77,8
85	105	2,34	3,51	4,68	5,85	7,05	11,7	23,4	28,1	35,1	46,8	3,5	−0,06	82,0
90	110	2,47	3,70	4,94	6,17	7,40	12,4	24,7	29,6	37,1	49,4	3,5	−0,06	86,5
95	115	2,59	3,88	5,18	6,47	7,77	13,0	25,9	31,1	38,9	51,8	3,5	−0,06	90,7
100	120	2,72	4,08	5,44	6,80	8,15	13,6	27,2	32,6	40,8	54,4	3,5	−0,06	95,2
100	125	3,47	5,20	6,94	8,67	10,4	17,3	34,7	–	–	–	3,5	−0,08	122
105	130	3,62	5,43	7,22	9,05	10,8	18,1	36,2	–	–	–	3,5	−0,08	127
110	140	4,62	6,93	9,22	11,5	13,9	23,1	46,2	–	–	–	3,5	−0,08	162
120	150	5,00	7,50	10,0	12,5	15,0	25,0	50,0	–	–	–	3,5	−0,08	175
130	160	5,36	8,04	10,7	13,4	16,1	26,8	53,6	–	–	–	3,5	−0,08	188
140	170	5,73	8,60	11,5	14,3	17,2	28,5	57,3	–	–	–	3,5	−0,08	201
150	180	6,10	9,15	12,2	15,2	18,3	30,5	61,0	–	–	–	3,5	−0,08	214
160	190	6,47	9,70	12,9	16,2	19,4	32,3	64,7	–	–	–	3,5	−0,08	227
170	200	6,85	10,3	13,7	17,1	20,6	34,3	68,5	–	–	–	3,5	−0,08	240

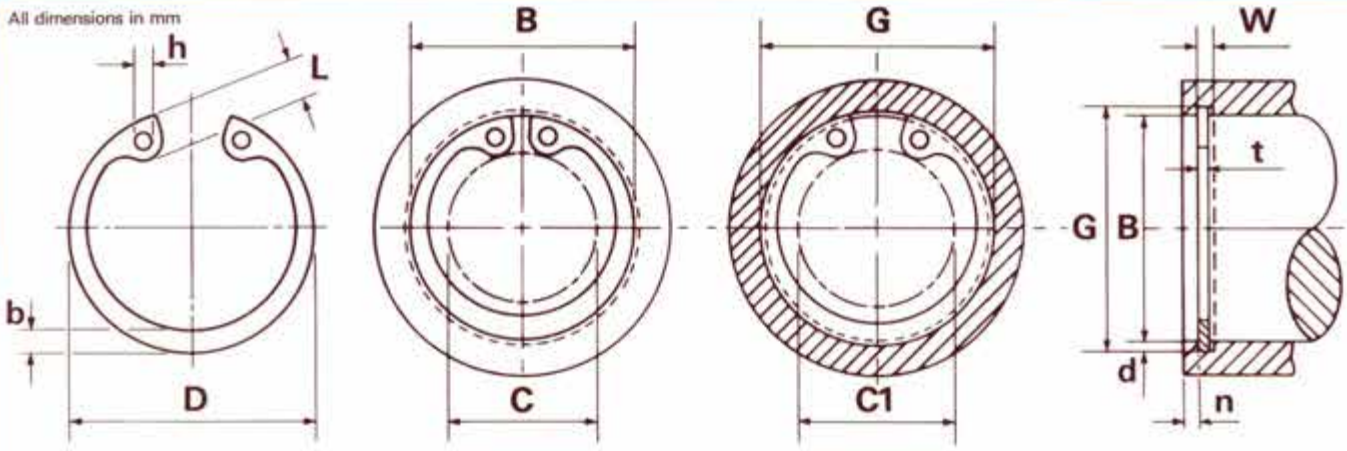
Standard material - carbon spring steel. Standard finish - self finish

STANDARD INTERNAL CIRCLIPS - EUROPEAN SPECIFICATIONS

D1300

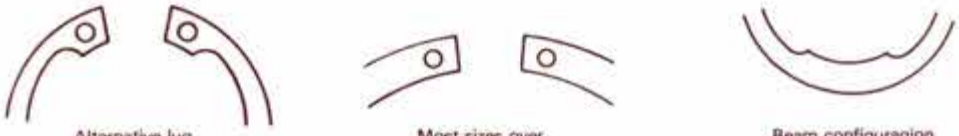
Incorporating DIN 472 & BS 3673 Pt.4

All dimensions in mm



Circlip in bore

Circlip in groove



Sizes printed in blue are preferred sizes

Alternative lug for larger sizes

Most sizes over 200 mm are without lugs

Beam configuragion on some larger sizes

† Thrust load calculations see pages 9 & 10

SIZE CODE	Bore	Groove (G)						Circlip (F)									Wt.	Tc†	Tg†
	B	G	Tol.	W	Tol.	n (min)	d ~	t	Tol.	D	Tol.	C	C1	L (max)	b ~	h (min)	(kg/k)	(N)	(N)
0080	8	8.4	+0.09 −0.00	0.90		0.6	0.2	0.80	+0.00 −0.05	8.7		3.0	3.6	2.4	1.1	1.0	0.11	6200	600
0090	9	9.4		0.90		0.6	0.2	0.80		9.8		3.7	4.4	2.5	1.3	1.0	0.17	7000	680
0095	9.5	9.9		1.10		0.6	0.2	1.00		10.3		3.2	3.9	3.0	1.3	1.2	0.22	9300	720
0100	10	10.4		1.10		0.6	0.2	1.00		10.8		3.3	4.0	3.2	1.4	1.2	0.24	9700	750
0110	11	11.4		1.10		0.6	0.2	1.00		11.8	+0.36 −0.10	4.1	4.8	3.3	1.5	1.2	0.30	10700	830
0120	12	12.5	+0.11 −0.00	1.10		0.8	0.3	1.00		13.0		4.9	5.7	3.4	1.7	1.5	0.34	11700	1130
0130	13	13.6		1.10		0.9	0.3	1.00		14.1		5.4	6.4	3.6	1.8	1.5	0.39	12700	1470
0140	14	14.6		1.10		0.9	0.3	1.00		15.1		6.2	7.2	3.7	1.9	1.7	0.45	13600	1580
0150	15	15.7		1.10		1.1	0.4	1.00		16.2		7.2	8.3	3.7	2.0	1.7	0.48	14600	1980
0160	16	16.8		1.10		1.2	0.4	1.00		17.3		8.0	9.2	3.8	2.0	1.7	0.54	15600	2410
0170	17	17.8		1.10		1.2	0.4	1.00		18.3		8.8	10.0	3.9	2.1	1.7	0.59	16600	2560
0180	18	19.0		1.10		1.5	0.5	1.00		19.5		9.4	10.8	4.1	2.2	2.0	0.61	17500	3390
0190	19	20.0	+0.13 −0.00	1.10		1.5	0.5	1.00		20.5	+0.42 −0.13	10.4	11.8	4.1	2.2	2.0	0.72	18500	3580
0200	20	21.0		1.10		1.5	0.5	1.00		21.5		11.2	12.6	4.2	2.3	2.0	0.75	19500	3770
0210	21	22.0		1.10		1.5	0.5	1.00		22.5		12.2	13.6	4.2	2.4	2.0	0.84	20400	3960
0220	22	23.0		1.10		1.5	0.5	1.00		23.5		13.2	14.6	4.2	2.5	2.0	0.86	21400	4150
0230	23	24.1		1.30		1.7	0.6	1.20		24.6		14.2	15.7	4.2	2.5	2.0	1.20	26900	4770
0240	24	25.2		1.30		1.8	0.6	1.20		25.9	+0.42 −0.21	14.8	16.4	4.4	2.6	2.0	1.21	28000	5430
0250	25	26.2	+0.21 −0.00	1.30		1.8	0.6	1.20		26.9		15.5	17.2	4.5	2.7	2.0	1.33	29200	5650
0260	26	27.2		1.30		1.8	0.6	1.20	+0.00 −0.06	27.9		16.1	17.8	4.7	2.8	2.0	1.35	30400	5880
0270	27	28.4		1.30		2.1	0.7	1.20		29.1		17.1	19.0	4.7	2.9	2.0	1.55	31600	7130
0280	28	29.4		1.30		2.1	0.7	1.20		30.1		17.9	19.8	4.8	2.9	2.0	1.64	32700	7390
0290	29	30.4		1.30		2.1	0.7	1.20		31.1		18.9	20.8	4.8	3.0	2.0	1.74	33900	7650
0300	30	31.4		1.30		2.1	0.7	1.20		32.1		19.9	21.8	4.8	3.0	2.0	1.87	35100	7920
0310	31	32.7		1.30	+0.14 −0.00	2.6	0.9	1.20		33.4		20.0	22.3	5.2	3.2	2.5	2.20	36200	9930
0320	32	33.7		1.30		2.6	0.9	1.20		34.4	+0.50 −0.25	20.6	22.9	5.4	3.2	2.5	1.98	37400	10300
0330	33	34.7		1.30		2.6	0.9	1.20		35.5		21.6	23.9	5.4	3.3	2.5	2.13	36800	10600
0340	34	35.7		1.60		2.6	0.9	1.50		36.5		22.6	24.9	5.4	3.3	2.5	2.88	49700	10900
0350	35	37.0		1.60		3.0	1.0	1.50		37.8		23.6	26.2	5.4	3.4	2.5	2.93	51100	13200
0360	36	38.0	+0.25 −0.00	1.60		3.0	1.0	1.50		38.8		24.6	27.2	5.4	4.0	2.5	3.23	52600	13600
0370	37	39.0		1.60		3.0	1.0	1.50		39.8		25.4	28.0	5.5	3.2	2.5	2.98	54100	13900
0380	38	40.0		1.60		3.0	1.0	1.50		40.8		26.4	29.0	5.5	3.7	2.5	3.54	55500	14300
0400	40	42.5		1.85		3.8	1.3	1.75		43.5		27.8	30.9	5.8	3.9	2.5	4.63	56600	18800
0410	41	43.5		1.85		3.8	1.3	1.75		44.5	+0.90 −0.39	28.6	31.7	5.9	4.0	2.5	5.37	58000	19300
0420	42	44.5		1.85		3.8	1.3	1.75		45.5		29.6	32.7	5.9	4.1	2.5	5.21	59500	19800
0450	45	47.5		1.85		3.8	1.3	1.75		48.5		32.0	35.1	6.2	4.3	2.5	5.88	63700	21200
0470	47	49.5		1.85		3.8	1.3	1.75		50.5		33.5	36.7	6.4	4.4	2.5	6.13	66500	22100
0480	48	50.5		1.85		3.8	1.3	1.75		51.5		34.5	37.7	6.4	4.5	2.5	6.31	68000	22600
0500	50	53.0		2.15		4.5	1.5	2.00		54.2		36.3	40.0	6.5	4.6	2.5	8.01	80900	28300
0510	51	54.0		2.15		4.5	1.5	2.00		55.2		37.3	41.0	6.5	4.7	2.5	8.72	82500	28800
0520	52	55.0		2.15		4.5	1.5	2.00		56.2		37.9	41.6	6.7	4.7	2.5	8.91	84100	29400
0550	55	58.0		2.15		4.5	1.5	2.00		59.2		40.7	44.4	6.8	5.0	2.5	9.44	89000	31100
0560	56	59.0		2.15		4.5	1.5	2.00		60.2		41.7	45.4	6.8	5.1	2.5	9.75	90600	31700
0570	57	60.0	+0.30 −0.00	2.15		4.5	1.5	2.00	+0.00 −0.07	62.2	+1.10 −0.46	42.7	46.4	6.8	5.1	2.5	9.56	92200	32200
0580	58	61.0		2.15		4.5	1.5	2.00		62.2		43.5	47.2	6.9	5.2	2.5	10.36	93800	32800
0600	60	63.0		2.15		4.5	1.5	2.00		64.2		44.7	48.4	7.3	5.4	2.5	11.15	97100	33900
0620	62	65.0		2.15		4.5	1.5	2.00		66.2		46.7	50.4	7.3	5.5	2.5	11.59	100000	35100
0630	63	66.0		2.15		4.5	1.5	2.00		67.2		47.7	51.4	7.3	5.6	2.5	11.78	102000	35600
0640	64	67.0		2.15		4.5	1.5	2.00		68.2		48.7	52.4	7.3	5.2	2.5	16.80	104000	36200
0650	65	68.0		2.65		4.5	1.5	2.50		69.2		49.0	52.8	7.6	5.8	3.0	17.71	131000	36800

Standard material - carbon spring steel. Standard finish - phosphate and oil.

STANDARD INTERNAL CIRCLIPS - EUROPEAN SPECIFICATIONS

D1300 (Continued)

Incorporating DIN 472 & BS 3673 Pt.4

SIZE CODE	Bore B	Groove (G) G	Tol.	W	Tol.	n (min)	d ~	Circlip (F) t	Tol.	D	Tol.	C	C1	L (max)	b ~	h (min)	Wt. (kg/k)	Tc† (N)	Tg† (N)
0670	67	70.0		2.65		4.5	1.5	2.50		72.5		50.8	54.6	7.7	6.0	3.0	17.71	136000	37900
0680	68	71.0		2.65		4.5	1.5	2.50		72.5		51.6	55.4	7.8	6.1	3.0	17.72	138000	38500
0700	70	73.0		2.65		4.5	1.5	2.50	+0.00	74.5	+1.10	53.6	57.4	7.8	6.2	3.0	17.65	142000	39600
0720	72	75.0	+0.30	2.65		4.5	1.5	2.50	−0.07	76.5	−0.46	55.6	59.4	7.8	6.4	3.0	19.70	146000	40700
0750	75	78.0	−0.00	2.65		4.5	1.5	2.50		79.5		58.6	62.4	7.8	6.6	3.0	20.62	152000	42400
0760	76	79.0		2.65	+0.14	4.5	1.5	2.50		80.7		59.6	63.4	7.8	6.1	3.0	22.68	154000	43000
0780	78	81.0		2.65		4.5	1.5	2.50		82.5		60.1	64.0	8.5	6.8	3.0	22.46	158000	44100
0800	80	83.5		2.65		5.3	1.8	2.50		85.5		62.1	66.5	8.5	7.0	3.0	21.38	162000	52800
0820	82	85.5		2.65	−0.00	5.3	1.8	2.50		87.5		64.1	68.5	8.5	6.2	3.0	22.27	166000	54100
0850	85	88.5		3.15		5.3	1.8	3.00		90.5		66.9	71.3	8.6	7.2	3.5	31.78	206000	56100
0880	88	91.5	+0.35	3.15		5.3	1.8	3.00		93.5		69.9	74.3	8.6	7.4	3.5	32.94	214000	58100
0900	90	93.5	−0.00	3.15		5.3	1.8	3.00	+0.00	95.5	+1.30	71.9	76.3	8.6	7.6	3.5	33.35	218000	59400
0920	92	95.5		3.15		5.3	1.8	3.00	−0.08	97.5	−0.54	73.7	78.1	8.7	7.8	3.5	35.72	223000	60700
0950	95	98.5		3.15		5.3	1.8	3.00		100.5		76.5	80.9	8.8	8.1	3.5	38.88	231000	62700
0980	98	101.5		3.15		5.3	1.8	3.00		103.5		79.0	83.5	9.0	8.3	3.5	42.16	238000	64700
1000	100	103.5		3.15		5.3	1.8	3.00		105.5		80.6	85.1	9.2	8.4	3.5	43.41	243000	66000
1020	102	106.0		4.15		6.0	2.0	4.00		108.0		82.0	87.0	9.5	8.5	3.5	55.20	330000	76900
1050	105	109.0		4.15		6.0	2.0	4.00		112.0		85.0	90.0	9.5	8.7	3.5	59.20	340000	79200
1080	108	112.0	+0.54	4.15		6.0	2.0	4.00		115.0		88.0	93.0	9.5	8.9	3.5	62.60	350000	81400
1100	110	114.0	−0.00	4.15		6.0	2.0	4.00		117.0		88.2	93.2	10.4	9.0	3.5	71.75	356000	82900
1120	112	116.0		4.15		6.0	2.0	4.00		119.0		90.0	95.0	10.5	9.1	3.5	70.68	362000	84400
1150	115	119.0		4.15		6.0	2.0	4.00		122.0		93.0	98.0	10.5	9.3	3.5	73.15	372000	86700
1200	120	124.0		4.15		6.0	2.0	4.00		127.0		96.9	102.0	11.0	9.7	3.5	80.40	388000	90500
1250	125	129.0		4.15		6.0	2.0	4.00		132.0		101.9	107.0	11.0	10.0	4.0	81.20	405000	94300
1270	127	131.0		4.15		6.0	2.0	4.00		135.0		103.9	109.0	11.0	10.0	4.0	80.80	411000	95800
1300	130	134.0		4.15		6.0	2.0	4.00		137.0		106.9	112.0	11.0	10.2	4.0	85.13	421000	98000
1350	135	139.0		4.15		6.0	2.0	4.00	+0.00	142.0	+1.50	111.5	116.0	11.2	10.5	4.0	94.79	437000	102000
1400	140	144.0		4.15		6.0	2.0	4.00	−0.10	147.0	−0.63	116.5	121.0	11.2	10.7	4.0	98.61	453000	106000
1450	145	149.0	+0.63	4.15	+0.18	6.0	2.0	4.00		152.0		121.0	126.0	11.4	10.9	4.0	106.50	469000	109000
1500	150	155.0	−0.00	4.15	−0.00	7.5	2.5	4.00		158.0		124.8	131.0	12.0	11.2	4.0	106.80	485000	141000
1550	155	160.0		4.15		7.5	2.5	4.00		164.0		129.8	136.0	12.0	11.4	4.0	128.00	502000	146000
1600	160	165.0		4.15		7.5	2.5	4.00		169.0		132.7	139.0	13.0	11.6	4.0	130.50	518000	151000
1650	165	170.0		4.15		7.5	2.5	4.00		174.5		137.7	144.0	13.0	11.8	4.0	132.00	534000	156000
1700	170	175.0		4.15		7.5	2.5	4.00		179.5		141.6	148.0	13.5	12.0	4.0	149.50	550000	160000
1750	175	180.0		4.15		7.5	2.5	4.00		184.5		146.6	153.0	13.5	12.0	4.0	158.50	566000	165000
1800	180	185.0		4.15		7.5	2.5	4.00		189.5		150.2	156.0	14.2	13.0	4.0	168.00	583000	170000
1850	185	190.0		4.15		7.5	2.5	4.00		194.5		155.2	161.0	14.2	13.0	4.0	177.50	599000	174000
1900	190	195.0		4.15		7.5	2.5	4.00		199.5	+1.70	160.2	166.0	14.3	13.0	4.0	184.00	615000	179000
1950	195	200.0		4.15		7.5	2.5	4.00		204.5	−0.72	165.2	171.0	14.2	13.0	4.0	189.60	631000	184000
2000	200	205.0	+0.72	4.15		7.5	2.5	4.00		209.5		170.2	176.0	14.3	13.0	4.0	196.00	647000	188000
2100	210	216.0	−0.00	5.15		9.0	3.0	5.00		222.0		180.2	187.0	14.2	14.0	4.0	263.00	739000	237000
2200	220	226.0		5.15		9.0	3.0	5.00		232.0		190.2	197.0	14.2	14.0	4.0	276.00	774000	249000
2300	230	236.0		5.15		9.0	3.0	5.00		242.0		200.2	207.0	14.2	14.0	4.0	291.00	809000	260000
2400	240	246.0		5.15		9.0	3.0	5.00		252.0		210.2	217.0	14.2	14.0	4.0	304.00	845000	271000
2500	250	256.0		5.15		9.0	3.0	5.00	+0.00	262.0		220.2	227.0	14.2	14.0	4.0	318.50	880000	283000
2600	260	268.0		5.15		12.0	4.0	5.00	−0.12	275.0	+2.00	226.0	235.0	16.2	16.0	5.0	385.00	915000	392000
2700	270	278.0	+0.81	5.15		12.0	4.0	5.00		285.0	−0.81	236.0	245.0	16.2	16.0	5.0	401.50	950000	407000
2800	280	288.0	−0.00	5.15		12.0	4.0	5.00		295.0		246.0	255.0	16.2	16.0	5.0	417.50	985000	422000
2900	290	298.0		5.15		12.0	4.0	5.00		305.0		256.0	265.0	16.2	16.0	5.0	433.40	1020000	437000
3000	300	308.0		5.15		12.0	4.0	5.00		315.0		266.0	275.0	16.2	16.0	5.0	446.00	1060000	452000
3100	310	320.0		6.20		15.0	5.0	6.00		327.0		267.8	279.0	20.2	20.0	6.0	658.50	1310000	584000
3200	320	330.0		6.20		15.0	5.0	6.00		337.0		277.8	289.0	20.2	20.0	6.0	682.00	1350000	603000
3300	330	340.0		6.20		15.0	5.0	6.00		347.0		287.8	299.0	20.2	20.0	6.0	705.00	1390000	622000
3400	340	350.0		6.20		15.0	5.0	6.00		357.0		297.8	309.0	20.2	20.0	6.0	729.00	1440000	641000
3500	350	360.0	+0.89	6.20	+0.22	15.0	5.0	6.00	+0.00	367.0	+2.50	307.8	319.0	20.2	20.0	6.0	752.50	1480000	660000
3600	360	370.0	−0.00	6.20	−0.00	15.0	5.0	6.00	−0.18	377.0	−1.00	317.8	329.0	20.2	20.0	6.0	769.00	1520000	679000
3700	370	380.0		6.20		15.0	5.0	6.00		387.0		327.8	339.0	20.2	20.0	6.0	793.00	1560000	697000
3800	380	390.0		6.20		15.0	5.0	6.00		397.0		337.8	349.0	20.2	20.0	6.0	817.00	1610000	716000
3900	390	400.0		6.20		15.0	5.0	6.00		407.0		347.8	359.0	20.2	20.0	6.0	838.50	1650000	735000
4000	400	410.0		6.20		15.0	5.0	6.00		417.0		357.8	369.0	20.2	20.0	6.0	862.50	1690000	754000

Reference to Table Headings

A = Free gap
a = Radial depth
B = Bore diameter
b = Beam dimension
C = Clearance on shaft or in bore
C_1 = Clearance in groove
D = Free diameter (Working)
D_1 = Free diamater (Non-functional)
d = Groove depth
E = End play take-up
F = Circlip details
G = Groove diameter
H = Height
h = Hole diameter
L = Lug depth
n = Edge margin
n_1 = Shaft or bore face to retained face
r = Radius
S = Shaft diameter
Tc = Thrust load for circlip
Tg = Thrust load of groove
t = Thickness
W = Groove width
ω = Wing dimension
Wt = Weight
X = Outer groove wall to retained face

Abbreviations used

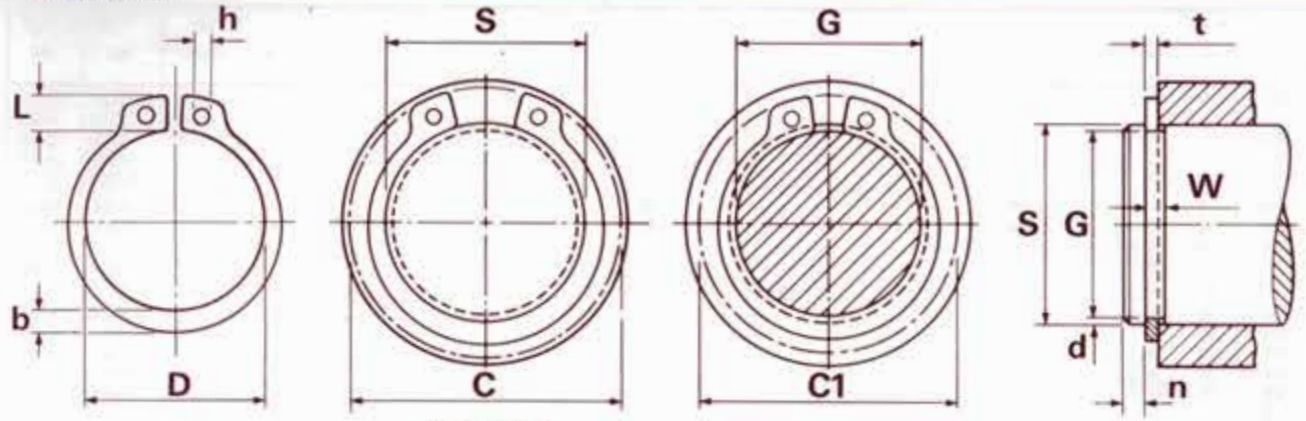
B.S. = British Standard
dec. = Decimal
frac. = Fraction
kg/k = Kilogrammes per thousand
lb.f = Pounds force
lb/k = Pounds per thousand
max. = Maximum
min. = Minimum
N = Newton
Nom. = Nominal
Tol. = Tolerance

STANDARD INTERNAL CIRCLIPS - EUROPEAN SPECIFICATIONS

D1400

Incorporating DIN 471 & BS 3673 Pt.4

All dimensions in mm

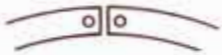


Circlip on shaft

Circlip in groove

Lug for sizes 3 to 9 mm

Alternative lug for sizes 4-8 mm



Most sizes over 185 mm are without lugs

Beam configuration on some larger sizes

Sizes printed in blue are preferred sizes

† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft S	Groove (G) G	Tol.	W	Tol.	n (min)	d ~	Circlip (F) t	Tol.	D	Tol.	C	C1	L (max)	b ~	h (min)	Wt. (kg/k)	Tc† (N)	Tg† (N)
0030	3	2.8	+0.00 −0.04	0.50		0.3	0.10	0.40		2.7		7.0	6.6	1.9	0.8	1.0	0.02	1170	110
0040	4	3.8		0.50		0.3	0.10	0.40		3.7	+0.04 −0.15	8.6	8.2	2.2	0.9	1.0	0.03	1600	150
0050	5	4.8	+0.00 −0.048	0.70		0.3	0.10	0.60	+0.00 −0.05	4.7		10.3	9.8	2.5	1.1	1.0	0.08	2900	190
0060	6	5.7		0.80		0.5	0.15	0.70		5.6		11.7	11.1	2.7	1.3	1.2	0.13	4100	340
0070	7	6.7		0.90		0.5	0.15	0.80		6.5		13.5	12.9	3.1	1.4	1.2	0.18	5500	400
0080	8	7.6	+0.00 −0.06	0.90		0.6	0.20	0.80		7.4	+0.06 −0.18	14.7	14.0	3.2	1.5	1.2	0.20	6200	600
0090	9	8.6		1.10		0.6	0.20	1.00		8.4		16.0	15.2	3.3	1.7	1.2	0.32	8800	680
0100	10	9.6		1.10		0.6	0.20	1.00		9.3		17.0	16.2	3.3	1.8	1.5	0.40	9700	750
0110	11	10.5		1.10		0.8	0.25	1.00		10.2		18.0	17.1	3.3	1.8	1.5	0.41	10700	1040
0120	12	11.5		1.10		0.8	0.25	1.00		11.0		19.0	18.1	3.3	1.8	1.7	0.45	11700	1130
0130	13	12.4		1.10		0.9	0.30	1.00		11.9	+0.10 −0.36	20.2	19.2	3.4	2.0	1.7	0.52	12700	1470
0140	14	13.4		1.10		0.9	0.30	1.00		12.9		21.4	20.4	3.5	2.1	1.7	0.56	13600	1580
0150	15	14.3	+0.00 −0.11	1.10		1.1	0.35	1.00		13.8		22.6	21.5	3.6	2.2	1.7	0.62	14600	1980
0160	16	15.2		1.10		1.2	0.40	1.00		14.7		23.8	22.6	3.7	2.2	1.7	0.69	15600	2410
0170	17	16.2		1.10		1.2	0.40	1.00		15.7		25.0	23.8	3.8	2.3	1.7	0.77	16600	2560
0180	18	17.0		1.30		1.5	0.50	1.20		16.5		26.2	24.8	3.9	2.4	2.0	0.99	21000	3390
0190	19	18.0		1.30		1.5	0.50	1.20		17.5		27.2	25.8	3.9	2.5	2.0	1.10	22200	3580
0200	20	19.0		1.30		1.5	0.50	1.20		18.5		28.4	27.0	4.0	2.6	2.0	1.18	23400	3770
0210	21	20.0	+0.00 −0.13	1.30		1.5	0.50	1.20		19.5	+0.13 −0.42	29.6	28.2	4.1	2.7	2.0	1.26	24500	3960
0220	22	21.0		1.30		1.5	0.50	1.20		20.5		30.8	29.4	4.2	2.8	2.0	1.39	25700	4150
0230	23	22.0		1.30		1.5	0.50	1.20		21.5		32.0	30.6	4.3	2.9	2.0	1.54	26900	4340
0240	24	22.9		1.30		1.7	0.55	1.20	+0.00 −0.06	22.2		33.2	31.7	4.4	3.0	2.0	1.52	28000	4980
0250	25	23.9		1.30		1.7	0.55	1.20		23.2		34.2	32.7	4.4	3.0	2.0	1.70	29200	5180
0260	26	24.9	+0.00 −0.21	1.30		1.7	0.55	1.20		24.2		35.5	33.9	4.5	3.1	2.0	1.75	30400	5390
0270	27	25.6		1.30	+0.14 −0.00	2.1	0.70	1.20		24.9	+0.21 −0.42	36.7	34.8	4.6	3.1	2.0	1.89	31600	7130
0280	28	26.6		1.60		2.1	0.70	1.50		25.9		37.9	36.0	4.7	3.2	2.0	2.47	40900	7390
0290	29	27.6		1.60		2.1	0.70	1.50		26.9		39.1	37.2	4.8	3.4	2.0	2.75	42400	7650
0300	30	28.6		1.60		2.1	0.70	1.50		27.9		40.5	38.6	5.0	3.5	2.0	2.93	43800	7920
0320	32	30.3		1.60		2.6	0.85	1.50		29.6		43.0	40.7	5.2	3.6	2.5	3.02	46700	10300
0330	33	31.3		1.60		2.6	0.85	1.50		30.5		44.0	41.7	5.2	3.7	2.5	3.30	48200	10600
0340	34	32.3		1.60		2.6	0.85	1.50		31.5	+0.25 −0.50	45.4	43.1	5.4	3.8	2.5	3.72	49700	10900
0350	35	33.0		1.60		3.0	1.00	1.50		32.2		46.8	44.2	5.6	3.9	2.5	3.78	51100	13200
0360	36	34.0		1.85		3.0	1.00	1.75		33.2		47.8	45.2	5.6	4.0	2.5	4.55	51400	13600
0380	38	36.0		1.85		3.0	1.00	1.75		35.2		50.2	47.6	5.8	4.2	2.5	5.08	54800	14300
0400	40	37.5	+0.00 −0.25	1.85		3.8	1.25	1.75		36.5		52.6	49.5	6.0	5.0	2.5	5.54	56600	18800
0420	42	39.5		1.85		3.8	1.25	1.75		38.5		55.7	52.5	6.5	5.0	2.5	5.99	59500	19800
0450	45	42.5		1.85		3.8	1.25	1.75		41.5		59.1	55.9	6.7	5.0	2.5	6.75	63700	21200
0460	46	43.5		1.85		3.8	1.25	1.75		42.5	+0.39 −0.90	60.1	56.9	6.7	5.0	2.5	7.24	65100	21700
0470	47	44.5		1.85		3.8	1.25	1.75		43.5		61.3	58.1	6.8	5.0	2.5	7.30	66500	22100
0480	48	45.5		1.85		3.8	1.25	1.75		44.5		62.5	59.3	6.9	5.0	2.5	7.51	67900	22600
0500	50	47.0		2.15		4.5	1.50	2.00		45.8		64.5	60.8	6.9	5.5	2.5	9.88	80900	28300
0520	52	49.0		2.15		4.5	1.50	2.00		47.8		66.7	63.0	7.0	5.5	2.5	9.53	84100	29400
0540	54	51.0		2.15		4.5	1.50	2.00		49.8		69.0	65.2	7.1	5.5	2.5	10.30	87400	30500
0550	55	52.0		2.15		4.5	1.50	2.00		50.8		70.2	66.4	7.2	5.5	2.5	10.41	89000	31100
0560	56	53.0	+0.00 −0.30	2.15		4.5	1.50	2.00	+0.00 −0.07	51.8	+0.46 −1.10	71.6	67.6	7.3	5.5	2.5	10.50	90600	31700
0580	58	55.0		2.15		4.5	1.50	2.00		53.8		73.6	69.6	7.3	5.6	2.5	12.47	93800	32800
0600	60	57.0		2.15		4.5	1.50	2.00		55.8		75.6	71.8	7.4	5.8	2.5	13.69	97100	33900
0620	62	59.0		2.15		4.5	1.50	2.00		57.8		77.8	74.0	7.5	6.0	2.5	12.36	100000	35100
0630	63	60.0		2.15		4.5	1.50	2.00		58.8		79.0	75.2	7.6	6.2	2.5	13.10	102000	35600
0650	65	62.0		2.65		4.5	1.50	2.50		60.8		81.4	77.6	7.8	6.3	3.0	20.44	131000	36800

Standard material - carbon spring steel. Standard finish - phosphate and oil.

STANDARD INTERNAL CIRCLIPS - EUROPEAN SPECIFICATIONS

D1400 (Continued)

Incorporating DIN 471 & BS 3673 Pt.4

SIZE CODE	Shaft	Groove (G)						Circlip (F)									Wt.	Tc†	Tg†
	S	G	Tol.	W	Tol.	n (min)	d ~	t	Tol.	D	Tol.	C	C1	L (max)	b ~	h (min)	(kg/k)	(N)	(N)
0670	67	64.0		2.65		4.5	1.50	2.50		62.5		83.6	79.8	7.9	6.4	3.0	20.43	135000	37900
0680	68	65.0		2.65		4.5	1.50	2.50		63.5		84.4	81.0	8.0	6.5	3.0	19.55	138000	38500
0700	70	67.0		2.65		4.5	1.50	2.50		65.5		87.0	83.2	8.1	6.6	3.0	22.13	142000	39600
0720	72	69.0	+0.00	2.65	+0.14	4.5	1.50	2.50	+0.00	67.5		89.2	85.4	8.2	6.8	3.0	21.60	146000	40700
0750	75	72.0	−0.30	2.65	−0.00	4.5	1.50	2.50	−0.07	70.5	+0.46	92.7	88.8	8.4	7.0	3.0	24.65	152000	42400
0770	77	74.0		2.65		4.5	1.50	2.50		72.5	−1.10	94.9	91.0	8.5	7.2	3.0	24.26	156000	43500
0780	78	75.0		2.65		4.5	1.50	2.50		73.5		96.1	92.2	8.6	7.3	3.0	28.10	158000	44100
0800	80	76.5		2.65		5.3	1.75	2.50		74.5		98.1	93.7	8.6	7.4	3.0	26.68	162000	52800
0820	82	78.5		2.65		5.3	1.75	2.50		76.5		100.3	95.9	8.7	7.6	3.0	28.35	166000	54100
0850	85	81.5		3.15		5.3	1.75	3.00		79.5		103.3	98.9	8.7	7.8	3.5	35.40	206000	56100
0880	88	84.5	+0.00	3.15		5.3	1.75	3.00		82.5		106.5	102.0	8.8	8.0	3.5	39.85	214000	58100
0900	90	86.5	−0.35	3.15		5.3	1.75	3.00	+0.00	84.5		108.5	104.0	8.8	8.2	3.5	38.89	218000	59400
0950	95	91.5		3.15		5.3	1.75	3.00	−0.08	89.5		114.8	111.0	9.4	8.6	3.5	42.39	231000	62700
0980	98	94.5		3.15		5.3	1.75	3.00		91.5		118.6	114.0	9.8	9.0	3.5	54.00	238000	64700
1000	100	96.5		3.15		5.3	1.75	3.00		94.5		120.2	116.0	9.6	9.0	3.5	48.86	243000	66000
1020	102	98.0		4.15		6.0	2.00	4.00		95.0	+0.54	122.4	118.0	9.7	9.2	3.5	68.73	330000	76900
1050	105	101.0		4.15		6.0	2.00	4.00		98.0	−1.30	126.2	122.0	10.1	9.3	3.5	73.16	340000	79200
1080	108	104.0	+0.00	4.15		6.0	2.00	4.00		100.0		129.0	124.0	10.0	9.5	3.5	83.45	349000	81400
1100	110	106.0	−0.54	4.15		6.0	2.00	4.00		103.0		131.2	127.0	10.1	9.6	3.5	75.24	356000	82900
1150	115	111.0		4.15		6.0	2.00	4.00		108.0		137.3	133.0	10.6	9.8	3.5	78.65	327000	86700
1200	120	116.0		4.15		6.0	2.00	4.00		113.0		143.1	138.0	11.0	10.2	3.5	85.58	388000	90500
1250	125	121.0		4.15		6.0	2.00	4.00		118.0		149.0	144.0	11.4	10.4	4.0	99.62	404000	94200
1300	130	126.0		4.15		6.0	2.00	4.00		123.0		154.4	150.0	11.6	10.7	4.0	98.10	421000	98000
1350	135	131.0		4.15		6.0	2.00	4.00		128.0		159.8	155.0	11.8	11.0	4.0	113.40	437000	102000
1400	140	136.0		4.15		6.0	2.00	4.00	+0.00	133.0		165.2	160.0	12.0	11.2	4.0	119.18	453000	106000
1450	145	141.0		4.15		6.0	2.00	4.00	−0.10	138.0		170.6	166.0	12.2	11.5	4.0	128.53	470000	109000
1500	150	145.0	+0.00	4.15		7.5	2.50	4.00		142.0		177.3	171.0	13.0	11.8	4.0	132.80	485000	141000
1550	155	150.0	−0.63	4.15	+0.18	7.5	2.50	4.00		146.0	+0.63	182.3	176.0	13.0	12.0	4.0	136.06	501000	146000
1600	160	155.0		4.15	−0.00	7.5	2.50	4.00		151.0	−1.50	188.0	182.0	13.3	12.2	4.0	137.50	518000	151000
1650	165	160.0		4.15		7.5	2.50	4.00		155.5		193.4	187.0	13.5	12.5	4.0	151.96	534000	156000
1700	170	165.0		4.15		7.5	2.50	4.00		160.5		198.4	192.0	13.5	12.9	4.0	169.00	550000	160000
1750	175	170.0		4.15		7.5	2.50	4.00		165.5		203.4	197.0	13.5	12.9	4.0	173.70	566000	165000
1800	180	175.0		4.15		7.5	2.50	4.00		170.5		210.0	204.0	14.2	13.5	4.0	188.00	582000	170000
1850	185	180.0		4.15		7.5	2.50	4.00		175.5		215.2	209.0	14.3	13.5	4.0	193.00	598000	174000
1900	190	185.0		4.15		7.5	2.50	4.00		180.5		220.0	214.0	14.2	14.0	4.0	203.00	615000	179000
1950	195	190.0		4.15		7.5	2.50	4.00		185.5		225.0	219.0	14.2	14.0	4.0	209.50	631000	184000
2000	200	195.0		4.15		7.5	2.50	4.00		190.5		230.0	224.0	14.2	14.0	4.0	214.00	647000	188000
2050	205	199.0	+0.00	5.15		9.0	3.00	5.00		193.0		235.0	228.0	14.2	14.0	4.0	278.00	721000	232000
2100	210	204.0	−0.72	5.15		9.0	3.00	5.00		198.0	+0.72	240.0	233.0	14.2	14.0	4.0	285.00	739000	238000
2200	220	214.0		5.15		9.0	3.00	5.00		208.0	−1.70	250.0	243.0	14.2	14.0	4.0	298.50	775000	249000
2300	230	224.0		5.15		9.0	3.00	5.00	+0.00	218.0		260.0	253.0	14.2	14.0	4.0	312.00	809000	260000
2400	240	234.0		5.15		9.0	3.00	5.00	−0.12	228.0		270.0	263.0	14.2	14.0	4.0	326.00	844000	271000
2500	250	244.0		5.15		9.0	3.00	5.00		238.0		280.0	272.0	14.2	14.0	4.0	340.00	880000	283000
2600	260	252.0		5.15		12.0	4.00	5.00		245.0		294.0	285.0	16.2	16.0	5.0	414.00	915000	392000
2700	270	262.0		5.15		12.0	4.00	5.00		255.0		304.0	295.0	16.2	16.0	5.0	430.50	950000	407000
2800	280	272.0	+0.00	5.15		12.0	4.00	5.00		265.0	+0.81	314.0	305.0	16.2	16.0	5.0	446.50	985000	422000
2900	290	282.0	−0.81	5.15		12.0	4.00	5.00		275.0	−2.00	324.0	315.0	16.2	16.0	5.0	463.00	1020000	437000
3000	300	292.0		5.15		12.0	4.00	5.00		285.0		334.0	325.0	16.2	16.0	5.0	479.00	1056000	452000
3100	310	300.0		6.20		15.0	5.00	6.00		293.0		352.2	341.0	20.2	20.0	6.0	710.50	1309000	584000
3200	320	310.0		6.20		15.0	5.00	6.00		303.0		362.2	351.1	20.2	20.0	6.0	734.00	1351000	603000
3300	330	320.0		6.20		15.0	5.00	6.00		313.0		372.2	361.0	20.2	20.0	6.0	757.00	1393000	622000
3400	340	330.0		6.20		15.0	5.00	6.00		323.0		382.2	371.0	20.2	20.0	6.0	780.00	1436000	641000
3500	350	340.0		6.20	+0.22	15.0	5.00	6.00	+0.00	333.0	+1.00	392.2	381.0	20.2	20.0	6.0	805.00	1478000	660000
3600	360	350.0	+0.00	6.20	−0.00	15.0	5.00	6.00	−0.18	343.0	−2.50	402.2	391.0	20.2	20.0	6.0	827.00	1520000	679000
3700	370	360.0	−0.89	6.20		15.0	5.00	6.00		353.0		412.2	401.0	20.2	20.0	6.0	850.00	1562000	697000
3800	380	370.0		6.20		15.0	5.00	6.00		363.0		422.2	411.0	20.2	20.0	6.0	873.00	1604000	716000
3900	390	380.0		6.20		15.0	5.00	6.00		373.0		432.2	421.0	20.2	20.0	6.0	896.00	1646000	735000
4000	400	390.0		6.20		15.0	5.00	6.00		383.0		442.2	431.0	20.2	20.0	6.0	919.00	1689000	754000

EQUIVALENTS

Anderton	Seeger	Walde/Salter	Anderton	Seeger	Walde/Salter	Anderton	Seeger	Walde/Salter
A0500	–	–	D1400	DIN471 (A)	7100*	N1500	–	5133
A0600	–	–	N1400	–	5100	A1500U,C&S	–	2025, 2021, 2026*
A0700	–	–	B1400	AZ	6100*	N1501	–	5131
A0900	–	–	M1408	AV	–	N1540	–	5144
A1000	–	–	N1408	–	5108	M1700	–	–
A1100	–	–	M1440	G	–	M1800	H	–
A1200	–	–	N1440	–	5555	N1800	–	5103
D1300	DIN472 (J)	7000*	D1460	DIN471 (AS)	–	D2000	DIN984 (JK)	–
N1300	–	N5000	N1460	–	5160	D2100	DIN983 (AK)	–
B1300	JZ	6000*	M1465	–	7115*	M2300	SB	–
N1302	–	N5002	N1465	–	5115	M2400	SW	–
N1305	–	5005	B1500	–	6133*	M2500	–	–
M1308	JV	–	D1500	DIN6799 (RS)	7133*	M3200	DIN5417 (SP)	–
N1308	–	5008						

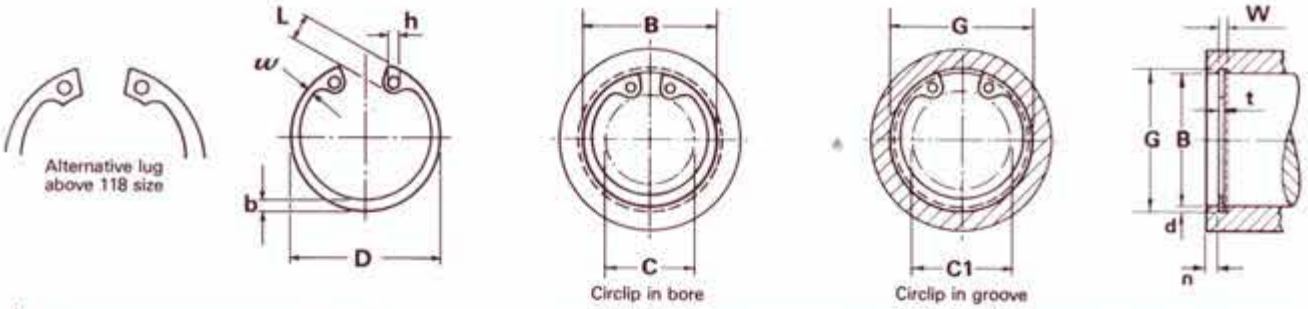
*Salter only

STANDARD INTERNAL CIRCLIPS - AMERICAN SPECIFICATIONS *

N1300

Equivalent to MIL-R-21248/MS 16625

All dimensions in inches



† Thrust load calculations see pages 9 & 10

* These circlips should not be used as direct substitutes for British Standard Imperial sizes

SIZE CODE	Bore (B)		Groove (G)						Circlip (F)										Wt.	Tc†	Tg†
	B		G	Tol.	W	Tol.	n	d	t	Tol.	D	Tol.	C	C1	L	b	w	h			
	(frac)	(dec)					(min)	~							(max)	~	~	(min)	(lb/k)	(lb.f)	(lb.f)
0025	1/4	.250	.268	± .001	.018	+ .002 − .000	.027	.009	.015		.280		.11	.13	.068	.025	.015	.029	0.08	530	130
0031	5/16	.312	.330		.018		.027	.009	.015		.346		.17	.19	.069	.033	.018	.029	0.11	660	160
0037	3/8	.375	.397		.029		.033	.011	.025		.415		.20	.22	.085	.040	.028	.039	0.25	1320	235
0043	7/16	.438	.461		.029		.036	.012	.025		.482		.23	.25	.101	.049	.029	.039	0.37	1550	285
0045	29/64	.453	.477		.029		.036	.012	.025		.498		.25	.27	.101	.050	.030	.045	0.43	1600	310
0050	1/2	.500	.530	± .002	.039		.045	.015	.035		.548	+ .010 − .005	.26	.29	.117	.053	.035	.045	0.70	2470	425
0051	—	.512	.542		.039		.045	.015	.035		.560		.27	.30	.119	.053	.035	.045	0.77	2530	435
0056	9/16	.562	.596		.039		.051	.017	.035		.620		.28	.32	.137	.053	.035	.045	0.86	2780	540
0062	5/8	.625	.665		.039		.060	.020	.035		.694		.35	.39	.137	.060	.035	.060	1.0	3090	705
0068	11/16	.688	.732		.039		.066	.022	.035		.763		.41	.45	.137	.063	.036	.060	1.2	3400	855
0075	3/4	.750	.796		.039	+ .003 − .000	.069	.023	.035		.831		.45	.50	.147	.070	.040	.060	1.3	3710	975
0077	—	.777	.825		.046		.072	.024	.042		.859		.47	.52	.151	.074	.044	.060	1.7	4610	1060
0081	13/16	.812	.862		.046		.075	.025	.042		.901		.49	.53	.160	.077	.044	.060	1.9	4820	1150
0086	—	.866	.920		.046		.081	.027	.042	± .002	.961		.54	.59	.160	.081	.045	.060	2.0	5140	1320
0087	7/8	.875	.931		.046		.084	.028	.042		.971		.55	.60	.160	.084	.045	.060	2.1	5190	1390
0090	—	.901	.959	± .003	.046		.087	.029	.042		1.000	+ .015 − .010	.58	.63	.160	.087	.047	.060	2.2	5350	1480
0093	15/16	.938	1.000		.046		.093	.031	.042		1.041		.61	.67	.160	.091	.050	.060	2.4	5570	1640
0100	1	1.000	1.066		.046		.099	.033	.042		1.111		.68	.74	.160	.104	.052	.060	2.7	5940	1870
0102	—	1.023	1.091		.046		.102	.034	.042		1.136		.70	.76	.160	.106	.054	.060	2.8	6070	1970
0106	1.1/16	1.062	1.130		.056		.102	.034	.050		1.180		.69	.75	.185	.110	.055	.076	3.7	7500	2040
0112	1.1/8	1.125	1.197	± .004	.056		.108	.036	.050		1.249	+ .025 − .020	.75	.82	.185	.116	.057	.076	4.0	7950	2290
0118	1.3/16	1.188	1.262		.056		.111	.037	.050		1.319		.81	.88	.185	.120	.058	.076	4.3	8400	2490
0125	1.1/4	1.250	1.330		.056		.120	.040	.050		1.388		.88	.95	.185	.124	.062	.076	4.8	8850	2830
0131	1.5/16	1.312	1.396		.056		.126	.042	.050		1.456		.94	1.02	.185	.130	.062	.076	5.0	9300	3120
0137	1.3/8	1.375	1.461		.056		.129	.043	.050		1.526		1.00	1.08	.185	.130	.063	.076	5.1	9700	3340
0143	1.7/16	1.438	1.528		.056		.135	.045	.050		1.596		1.06	1.15	.185	.133	.065	.076	5.8	10200	3660
0145	—	1.456	1.548		.056		.138	.046	.050		1.616		1.08	1.17	.185	.133	.065	.076	6.0	10300	3790
0150	1.1/2	1.500	1.594		.056	+ .004 − .000	.141	.047	.050		1.660		1.13	1.22	.185	.133	.066	.076	6.1	10600	3990
0156	1.9/16	1.562	1.658		.068		.144	.048	.062		1.734		1.15	1.24	.205	.160	.079	.076	9.1	11400	4240
0162	1.5/8	1.625	1.725		.068		.150	.050	.062		1.804		1.21	1.31	.205	.160	.080	.076	10.1	11800	4590
0165	—	1.653	1.755	± .005	.068		.153	.051	.062		1.835	+ .035 − .025	1.24	1.34	.205	.167	.083	.076	10.4	12100	4760
0168	1.11/16	1.688	1.792		.068		.156	.052	.062		1.874		1.27	1.38	.205	.170	.085	.076	10.8	12300	4960
0175	1.3/4	1.750	1.858		.068		.162	.054	.062		1.942		1.34	1.44	.205	.175	.082	.076	11.5	12800	5340
0181	1.13/16	1.812	1.922		.068		.165	.055	.062		2.012		1.40	1.51	.205	.170	.084	.091	12.0	13200	5630
0185	—	1.850	1.962		.068		.168	.056	.062		2.054		1.44	1.55	.205	.170	.085	.091	12.8	13500	5860
0187	1.7/8	1.875	1.989		.068		.171	.057	.062		2.072		1.46	1.58	.205	.170	.085	.091	12.8	13700	6040
0193	1.15/16	1.938	2.056		.068		.177	.059	.062		2.141		1.52	1.64	.205	.165	.079	.091	13.3	14100	6470
0200	2	2.000	2.122		.068		.183	.061	.062		2.210		1.59	1.71	.205	.170	.085	.091	13.0	14600	6900
0206	2.1/16	2.062	2.186		.086		.186	.062	.078		2.280		1.61	1.73	.225	.186	.091	.091	18.0	18900	7230
0212	2.1/8	2.125	2.251		.086		.189	.063	.078		2.350		1.65	1.78	.236	.195	.096	.091	19.4	19500	7570
0218	2.3/16	2.188	2.318		.086		.195	.065	.078		2.415		1.71	1.84	.236	.199	.098	.091	19.6	20000	8040
0225	2.1/4	2.250	2.382		.086		.198	.066	.078		2.490		1.77	1.91	.236	.203	.107	.091	21.8	20600	8400
0231	2.5/16	2.312	2.450		.086		.207	.069	.078		2.560		1.84	1.98	.236	.205	.106	.091	22.6	21200	9020
0237	2.3/8	2.375	2.517		.086		.213	.071	.078		2.630		1.90	2.04	.236	.207	.108	.091	23.8	21700	9540
0244	2.7/16	2.440	2.584		.086		.216	.072	.078		2.702	+ .040 − .030	1.96	2.11	.236	.205	.104	.108	25.3	22300	10100
0250	2.1/2	2.500	2.648	± .006	.086	+ .005 − .000	.222	.074	.078	± .003	2.775		2.02	2.17	.236	.210	.103	.108	29.3	22900	13000
0256	2.9/16	2.562	2.714		.103		.228	.076	.093		2.844		2.02	2.18	.268	.222	.109	.108	30.4	28000	11000
0262	2.5/8	2.625	2.781		.103		.234	.078	.093		2.910		2.08	2.24	.268	.226	.118	.108	34.5	28600	11600
0268	2.11/16	2.688	2.848		.103		.240	.080	.093		2.980		2.15	2.31	.268	.236	.122	.108	36.2	29300	12200
0275	2.3/4	2.750	2.914		.103		.246	.082	.093		3.050		2.18	2.34	.284	.234	.114	.108	35.5	30000	12800
0281	2.13/16	2.812	2.980		.103		.252	.084	.093		3.121		2.24	2.40	.284	.230	.115	.108	39.2	30800	13400
0287	2.7/8	2.875	3.051		.103		.264	.088	.093		3.191		2.30	2.47	.284	.240	.125	.108	41.0	31500	14300
0300	3	3.000	3.182		.103		.273	.091	.093		3.325		2.43	2.60	.284	.250	.124	.108	42.5	32900	15400
0306	3.1/16	3.062	3.248		.120		.279	.093	.109		3.418		2.46	2.64	.299	.254	.126	.123	54.4	39300	16100
0312	3.1/8	3.125	3.315		.120		.285	.095	.109		3.488		2.52	2.71	.299	.260	.129	.123	56.0	40100	16800
0315	—	3.149	3.348		.120		.288	.096	.109		3.523		2.55	2.74	.299	.260	.129	.123	57.1	40400	17100
0325	3.1/4	3.250	3.446		.120		.294	.098	.109		3.623		2.65	2.84	.299	.269	.135	.123	59.9	41700	18000
0334	3.11/32	3.346	3.546		.120		.300	.100	.109		3.734	± .055	2.69	2.89	.323	.276	.140	.123	63.0	43000	18900
0347	3.15/32	3.469	3.675		.120		.309	.103	.109		3.857		2.77	2.96	.350	.294	.143	.123	69.0	44500	20200
0350	3.1/2	3.500	3.710		.120		.315	.105	.109		3.890		2.80	2.90	.350	.294	.143	.123	71.0	44900	20800
0354	—	3.543	3.776		.120		.321	.107	.109		3.936		2.84	3.07	.350	.292	.142	.123	72.1	45500	21400
0362	3.5/8	3.625	3.841		.120		.324	.108	.109		4.024		2.92	3.13	.350	.298	.149	.123	73.0	46500	22100
0375	3.3/4	3.750	3.974		.120		.336	.112	.109		4.157		3.04	3.26	.350	.309	.155	.123	78.0	48200	23700
0387	3.7/8	3.875	4.107		.120		.348	.116	.109		4.291	± .065	3.17	3.40	.350	.312	.165	.123	87.1	49800	25400
0393	3.15/16	3.938	4.174		.120		.354	.118	.109		4.358		3.23	3.46	.350	.319	.166	.123	87.9	50600	26300

Standard material - carbon spring steel. Standard finish - phosphate and oil.

STANDARD INTERNAL CIRCLIPS - AMERICAN SPECIFICATIONS *
N1300 (Continued)

Equivalent to MIL-R-21248/MS 16625

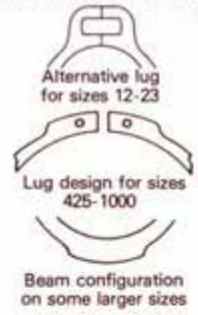
SIZE CODE	Bore (B)		Groove (G)						Circlip (F)										Wt.	Tc†	Tg†
	B (frac)	B (dec)	G	Tol.	W	Tol.	n (min)	d	t	Tol.	D	Tol.	C	C1	L (max)	b ~	w ~	h (min)	(lb/k)	(lb.f)	(lb.f)
0400	4	4.000	4.240		.120		.360	.120	.109		4.424		3.24	3.47	.378	.330	.166	.123	95.0	51400	27100
0412	4.1/8	4.125	4.365		.120		.360	.120	.109		4.558		3.36	3.60	.378	.330	.171	.123	97.0	53000	28000
0425	4.1/4	4.250	4.490		.120		.360	.120	.109		4.691		3.49	3.72	.378	.335	.180	.123	100	54600	28800
0433	—	4.331	4.571	± .006	.120	+ .005 − .000	.360	.120	.109	± .003	4.756		3.50	3.73	.413	.345	.180	.151	107	55600	29400
0450	4.1/2	4.500	4.740		.120		.360	.120	.109		4.940		3.67	3.90	.413	.351	.181	.151	111	57800	30500
0462	4.5/8	4.625	4.865		.120		.360	.120	.109		5.076		3.79	4.03	.413	.360	.185	.151	119	59400	31400
0475	4.3/4	4.750	4.995		.120		.366	.122	.109		5.213	± .065	3.92	4.16	.413	.370	.175	.151	124	61000	32800
0500	5	5.000	5.260		.120		.390	.130	.109		5.485		4.10	4.36	.445	.395	.218	.151	136	64200	36800
0525	5.1/4	5.250	5.520		.139		.405	.135	.125		5.770		4.31	4.58	.465	.408	.212	.151	175	77300	40100
0537	5.3/8	5.375	5.650	± .007	.139	+ .006 − .000	.405	.135	.125	± .004	5.910		4.44	4.71	.465	.408	.198	.151	179	78800	41000
0550	5.1/2	5.500	5.770		.139		.405	.135	.125		6.066		4.56	4.83	.465	.408	.200	.151	189	81000	42000
0575	5.3/4	5.750	6.020		.139		.405	.135	.125		6.336		4.81	5.08	.465	.408	.198	.151	195	84700	43900
0600	6	6.000	6.270		.139		.405	.135	.125		6.620		5.06	5.33	.465	.416	.223	.151	204	88400	45800
0625	6.1/4	6.250	6.530		.174		.420	.140	.156		6.895	± .080	5.34	5.61	.454	.441	.213	.182	263	114900	49500
0650	6.1/2	6.500	6.790		.174		.435	.145	.156		7.170		5.59	5.87	.454	.441	.244	.182	281	119500	53300
0662	6.5/8	6.625	6.925		.174		.450	.150	.156		7.308		5.71	6.01	.454	.441	.220	.182	300	121700	56200
0675	6.3/4	6.750	7.055		.174		.456	.152	.156		7.445		5.73	6.03	.508	.456	.224	.182	325	124000	58000
0700	7	7.000	7.315		.174		.471	.157	.156		7.720		5.91	6.22	.540	.485	.258	.182	344	128600	62200
0725	7.1/4	7.250	7.575		.209		.486	.162	.187		7.995		6.10	6.42	.570	.490	.238	.182	428	159700	66400
0750	7.1/2	7.500	7.840		.209		.510	.170	.187		8.270		6.35	6.69	.570	.507	.282	.182	476	165200	72100
0775	7.3/4	7.750	8.100		.209	+ .008	.525	.175	.187		8.545		6.62	6.97	.560	.500	.241	.182	570	170700	76700
0800	8	8.000	8.360	± .008	.209	− .000	.540	.180	.187	± .005	8.820		6.79	7.15	.600	.550	.280	.182	606	152700	81400
0825	8.1/4	8.250	8.620		.209		.555	.185	.187		9.095		7.04	7.41	.600	.548	.260	.182	603	157500	86300
0850	8.1/2	8.500	8.880		.209		.570	.190	.187		9.285		7.23	7.60	.632	.573	.277	.182	634	162300	91300
0875	8.3/4	8.750	9.145		.209		.591	.197	.187		9.558	± .090	7.48	7.88	.632	.576	.283	.182	653	167000	97700
0900	9	9.000	9.405		.209		.606	.202	.187		9.830		7.73	8.13	.632	.592	.294	.182	732	171800	103000
0925	9.1/4	9.250	9.668		.209		.627	.209	.187		10.102		7.98	8.39	.632	.622	.299	.182	767	176600	109000
0950	9.1/2	9.500	9.930		.209		.645	.215	.187		10.375		8.23	8.65	.632	.622	.354	.182	803	181400	116000
0975	9.3/4	9.750	10.190		.209		.660	.220	.187		10.648		8.50	8.93	NO	.622	.295	.182	833	186200	121300
1000	10	10.000	10.450		.209		.675	.225	.187		10.920		8.75	9.19	LUG	.622	.295	.182	863	191000	127200

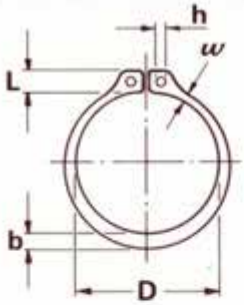
STANDARD EXTERNAL CIRCLIPS - AMERICAN SPECIFICATIONS *
N1400

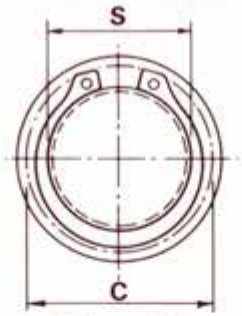
Equivalent to MIL-R-21248/MS 16624

All dimensions in inches

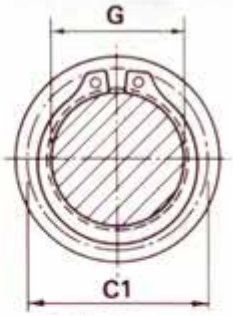
* These circlips should not be used as direct substitutes for British Standard Imperial sizes



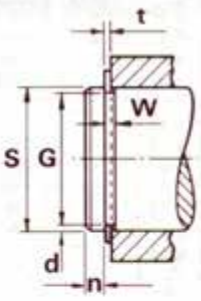




Circlip on shaft



Circlip in groove



*Sizes 12-23 Beryllium copper only

† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft (S)		Groove (G)						Circlip (F)										Wt.	Tc†	Tg†
	S (frac)	S (dec)	G	Tol.	W	Tol.	n (min)	d ~	t	Tol.	D	Tol.	C	C1	L (max)	b ~	w ~	h (min)	(lb/k)	(lb.f)	(lb.f)
*0012	1/8	.125	.117		.012		.014	.004	.010	± .001	.112		.22	.214	.048	.018	.011	.024	0.018	110	28
*0015	5/32	.156	.146		.012		.017	.005	.010		.142		.27	.260	.056	.026	.016	.024	0.037	130	44
*0018	3/16	.188	.175		.018	+ .002	.022	.007	.015		.168		.30	.286	.052	.025	.016	.023	0.059	240	69
*0019	—	.197	.185	± .0015	.018	− .000	.020	.006	.015		.179	+ .002	.32	.307	.058	.026	.016	.024	0.063	250	67
*0021	7/32	.219	.205		.018		.023	.007	.015		.196	− .004	.34	.324	.058	.028	.017	.024	0.074	280	87
*0023	15/64	.236	.222		.018		.023	.007	.015		.215		.36	.341	.058	.030	.019	.024	0.086	310	93
0025	1/4	.250	.230		.029		.032	.010	.025		.225		.45	.43	.083	.035	.025	.039	0.21	880	141
0027	—	.276	.255		.029		.035	.010	.025		.250		.48	.46	.084	.035	.024	.039	0.25	980	164
0028	9/32	.281	.261		.029		.033	.010	.025	± .002	.256		.49	.47	.083	.038	.025	.039	0.24	990	160
0031	5/16	.312	.290		.029		.036	.011	.025		.281	+ .002	.54	.52	.090	.040	.026	.039	0.27	1100	194
0034	11/32	.344	.321	± .002	.029	+ .003	.038	.012	.025		.309	− .005	.57	.55	.090	.042	.026	.039	0.31	1210	224
0035	—	.354	.330		.029	− .000	.038	.012	.025		.320		.59	.57	.090	.046	.029	.039	0.35	1250	240
0037	3/8	.375	.352		.029		.038	.012	.025		.338		.61	.59	.091	.050	.030	.039	0.39	1320	244
0039	—	.394	.369		.029		.041	.013	.025		.354		.62	.60	.090	.052	.031	.039	0.42	1390	278
0040	13/32	.406	.382		.029		.039	.012	.025		.366		.63	.61	.090	.054	.033	.039	0.43	1430	275

Standard material - carbon spring steel. Standard finish - phosphate and oil.

STANDARD EXTERNAL CIRCLIPS - AMERICAN SPECIFICATIONS *

N1400 (Continued)

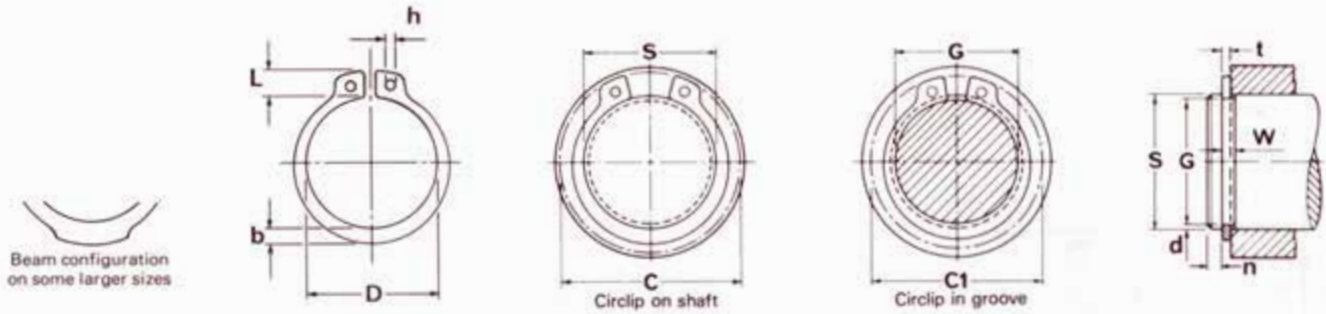
Equivalent to MIL-R-21248/MS 16624

SIZE CODE	Shaft (S)		Groove (G)						Circlip (F)										Wt.	Tc†	Tg†
	S (frac)	S (dec)	G	Tol.	W	Tol.	n (min)	d ~	t	Tol.	D	Tol.	C	C1	L (max)	b ~	ω ~	h (min)	(lb/k)	(lb.f)	(lb.f)
0043	7/16	.438	.412		.029		.042	.013	.025		.395	+.002 −.005	.66	.64	.091	.055	.033	.039	0.50	1550	322
0046	15/32	.469	.443		.029		.042	.013	.025		.428		.68	.66	.091	.060	.035	.039	0.54	1660	345
0050	1/2	.500	.468	± .002	.039		.051	.016	.035		.461		.77	.74	.111	.065	.040	.045	0.91	2470	452
0055	—	.551	.519		.039		.051	.016	.035		.509		.81	.78	.111	.053	.036	.045	0.90	2730	500
0056	9/16	.562	.530		.039		.051	.016	.035		.521		.82	.79	.111	.072	.041	.045	1.10	2780	508
0059	19/32	.594	.559		.039		.057	.017	.035		.550		.86	.83	.112	.076	.043	.045	1.20	2940	588
0062	5/8	.625	.588		.039		.060	.018	.035		.579		.90	.87	.113	.080	.045	.045	1.30	3090	654
0066	43/64	.672	.631		.039	+.003 −.000	.066	.020	.035		.621		.93	.89	.113	.082	.043	.045	1.40	3320	780
0068	11/16	.688	.646		.046		.068	.021	.042		.635	+.005 −.010	1.01	.97	.140	.084	.048	.050	1.80	4080	817
0075	3/4	.750	.704		.046		.074	.023	.042		.693		1.09	1.05	.140	.092	.051	.050	2.10	4450	975
0078	25/32	.781	.733	± .003	.046		.076	.024	.042		.722		1.12	1.08	.140	.094	.052	.050	2.2	4600	1060
0081	13/16	.812	.762		.046		.080	.025	.042		.751		1.15	1.10	.140	.096	.054	.050	2.5	4800	1150
0087	7/8	.875	.821		.046		.085	.027	.042	± .002	.810		1.21	1.16	.141	.104	.057	.050	2.8	5200	1340
0093	15/16	.938	.882		.046		.088	.028	.042		.867		1.34	1.29	.170	.110	.063	.076	3.1	5600	1480
0098	63/64	.984	.926		.046		.091	.029	.042		.910		1.39	1.34	.171	.114	.065	.076	3.5	5800	1610
0100	1	1.000	.940		.046		.094	.030	.042		.925		1.41	1.35	.171	.116	.065	.076	3.6	5900	1700
0102	—	1.023	.961		.046		.097	.031	.042		.946		1.43	1.37	.172	.118	.066	.076	3.9	6100	1790
0106	1.1/16	1.062	.998		.056		.102	.032	.050		.982		1.50	1.44	.185	.122	.069	.076	4.8	7500	1920
0112	1.1/8	1.125	1.059		.056		.105	.033	.050		1.041		1.55	1.49	.186	.128	.071	.076	5.1	7900	2100
0118	1.3/16	1.188	1.118		.056		.111	.035	.050		1.098		1.61	1.54	.186	.132	.072	.076	5.6	8400	2350
0125	1.1/4	1.250	1.176	± .004	.056		.117	.037	.050		1.156	+.010 −.015	1.69	1.62	.187	.140	.076	.076	5.9	8800	2610
0131	1.5/16	1.312	1.232		.056		.126	.040	.050		1.214		1.75	1.67	.187	.146	.077	.076	6.8	9300	2970
0137	1.3/8	1.375	1.291		.056		.132	.042	.050		1.272		1.80	1.72	.188	.152	.082	.076	7.2	9700	3270
0143	1.7/16	1.438	1.350		.056		.138	.044	.050		1.333		1.87	1.79	.188	.160	.086	.076	8.1	10200	3580
0150	1.1/2	1.500	1.406		.056	+.004 −.000	.147	.047	.050		1.387		1.99	1.90	.218	.168	.091	.118	9.0	10600	3990
0156	1.9/16	1.562	1.468		.068		.148	.047	.062		1.446		1.95	1.85	.189	.180	.098	.100	11.7	10700	4150
0162	1.5/8	1.625	1.529		.068		.151	.048	.062		1.503		2.17	2.08	.189	.180	.097	.100	12.8	11100	4410
0168	1.11/16	1.688	1.589		.068		.156	.049	.062		1.560		2.04	1.95	.205	.197	.099	.100	13.2	11500	4720
0175	1.3/4	1.750	1.650		.068		.157	.050	.062		1.618	+.013 −.020	2.11	2.01	.205	.197	.101	.100	13.8	11900	4950
0177	—	1.772	1.669	± .005	.068		.162	.051	.062		1.618		2.19	2.09	.205	.197	.102	.100	14.1	12100	5160
0181	1.13/16	1.812	1.708		.068		.163	.052	.062		1.675		2.23	2.13	.205	.197	.095	.100	14.7	12400	5330
0187	1.7/8	1.875	1.769		.068		.166	.053	.062		1.735		2.29	2.19	.205	.197	.104	.100	15.5	12800	5620
0196	—	1.968	1.857		.068		.174	.055	.062		1.819		2.39	2.27	.205	.197	.106	.123	18.2	13400	5170
0200	2	2.000	1.886		.068		.178	.057	.062		1.850		2.48	2.36	.232	.224	.108	.123	19.2	13600	6450
0206	2.1/16	2.062	1.946		.086		.183	.058	.078		1.906		2.52	2.40	.225	.217	.111	.123	22.6	17700	6760
0212	2.1/8	2.125	2.003		.086		.192	.061	.078		1.964		2.61	2.48	.236	.228	.120	.123	24.4	18200	7330
0215	2.5/32	2.156	2.032		.086		.195	.062	.078		1.993		2.62	2.49	.225	.217	.113	.123	26.6	18500	7560
0225	2.1/4	2.250	2.120		.086		.204	.065	.078		2.081	+.015 −.025	2.87	2.74	.225	.217	.116	.123	26.0	19300	8270
0231	2.5/16	2.312	2.178		.086		.210	.067	.078		2.139		2.94	2.81	.225	.217	.118	.123	28.4	19800	8760
0237	2.3/8	2.375	2.239		.086		.213	.068	.078		2.197		2.86	2.72	.236	.228	.119	.123	27.9	20400	9130
0243	2.7/16	2.438	2.299		.086		.217	.069	.078		2.255		2.92	2.78	.236	.228	.120	.123	29.4	20900	9580
0250	2.1/2	2.500	2.360		.086		.219	.070	.078		2.313		2.98	2.84	.236	.228	.122	.123	29.7	21400	9900
0255	—	2.559	2.419		.086		.219	.070	.078		2.377		3.09	2.94	.258	.250	.130	.123	31.7	21900	10100
0262	2.5/8	2.625	2.481		.086		.225	.072	.078		2.428		3.11	2.96	.236	.228	.120	.123	35.0	22500	10700
0268	2.11/16	2.688	2.541		.086		.230	.073	.078		2.485		3.32	3.18	.273	.246	.129	.123	36.0	23000	11200
0275	2.3/4	2.750	2.602		.103		.231	.074	.093	± .003	2.543		3.33	3.18	.284	.276	.145	.123	47.0	28100	11500
0287	2.7/8	2.875	2.721		.103	+.005 −.000	.240	.077	.093		2.659		3.42	3.26	.268	.260	.133	.123	48.4	29400	12500
0293	2.15/16	2.938	2.779		.103		.247	.079	.093		2.717		3.49	3.32	.268	.260	.125	.123	50.0	30000	13200
0300	3	3.000	2.838		.103		.252	.081	.093		2.775		3.55	3.38	.268	.260	.138	.123	51.5	30700	13700
0306	3.1/16	3.062	2.898		.103		.255	.082	.093		2.832		3.61	3.44	.268	.260	.131	.123	56.8	31300	14200
0312	3.1/8	3.125	2.957	± .006	.103		.261	.084	.093		2.892		3.75	3.57	.305	.272	.141	.123	57.9	32000	14800
0315	3.5/32	3.156	2.986		.103		.264	.085	.093		2.920		3.74	3.56	.284	.276	.143	.123	59.0	32300	15200
0325	3.1/4	3.250	3.076		.103		.270	.087	.093		3.006		3.83	3.65	.284	.276	.145	.123	61.9	33200	16000
0334	3.11/32	3.346	3.166		.103		.279	.090	.093		3.092		3.93	3.74	.284	.276	.147	.123	63.9	34200	17000
0343	3.7/16	3.438	3.257		.103		.280	.090	.093		3.179	+.020 −.030	4.02	3.83	.284	.276	.130	.123	65.9	35200	17600
0350	3.1/2	3.500	3.316		.120		.285	.092	.109		3.237		4.15	3.96	.320	.285	.148	.123	71.9	42000	18200
0354	—	3.543	3.357		.120		.288	.093	.109		3.277		4.20	4.00	.320	.288	.149	.123	72.9	42500	18600
0362	3.5/8	3.625	3.435		.120		.294	.095	.109		3.352		4.28	4.09	.323	.315	.153	.123	76.0	43400	19500
0368	3.11/16	3.688	3.493		.120		.301	.097	.109		3.410		4.31	4.11	.335	.302	.156	.123	80.0	44200	20300
0375	3.3/4	3.750	3.552		.120		.306	.099	.109		3.468		4.44	4.23	.337	.310	.160	.123	82.9	44900	21000
0387	3.7/8	3.875	3.673		.120		.312	.101	.109		3.584		4.56	4.35	.335	.318	.163	.123	87.9	46400	22100
0393	3.15/16	3.938	3.734		.120		.315	.102	.109		3.642		4.60	4.39	.323	.318	.163	.123	95.0	47200	22700
0400	4	4.000	3.792		.120		.321	.104	.109		3.700		4.72	4.50	.352	.344	.176	.123	100	47900	23500
0425	4.1/4	4.250	4.065		.120		.287	.092	.109		3.989		4.91	4.72	.323	.318	.176	.123	112	50900	22200
0437	4.3/8	4.375	4.190		.120		.287	.092	.109		4.106		5.04	4.84	.323	.318	.181	.123	115	52400	22900
0450	4.1/2	4.500	4.310		.120		.294	.095	.109		4.223		5.16	4.96	.323	.285	.128	.123	100	53900	24200
0475	4.3/4	4.750	4.550		.120		.309	.100	.109		4.458		5.47	5.26	.437	.303	.152	.123	113	56900	26900
0500	5	5.000	4.790		.120		.324	.105	.109		4.692		5.72	5.50	.445	.360	.186	.151	149	59900	29700
0525	5.1/4	5.250	5.030		.139		.339	.110	.125		4.927		6.18	5.95	.457	.372	.211	.151	188	72200	32700
0550	5.1/2	5.500	5.265	± .007	.139	+.006 −.000	.363	.117	.125	± .004	5.162	+.020 −.040	6.43	6.19	.457	.390	.209	.151	196	75600	36500
0575	5.3/4	5.750	5.505		.139		.378	.122	.125		5.396		6.68	6.43	.457	.408	.220	.151	199	79000	39800
0600	6	6.000	5.745		.139		.393	.127	.125		5.631		6.93	6.67	.457	.381	.171	.151	212	82500	43300
0625	6.1/4	6.250	5.985		.174		.409	.132	.156		5.866		7.28	7.01	.508	.396	.176	.151	281	107000	46800
0650	6.1/2	6.500	6.225		.174		.425	.137	.156		6.100	+.020 −.050	7.53	7.25	.508	.438	.236	.151	322	112000	50500
0675	6.3/4	6.750	6.465		.174		.440	.142	.156		6.335		7.78	7.49	.508	.456	.246	.182	356	116000	54400
0700	7	7.000	6.705		.174		.455	.147	.156		6.570		8.03	7.73	.508	.460	.256	.182	388	120000	58400
0750	7.1/2	7.500	7.180	± .008	.209	+.008 −.000	.492	.160	.187	± .005	7.039		8.78	8.45	.632	.507	.269	.182	534	143000	67900
0800	8	8.000	7.660		.209		.522	.170	.187		7.508		9.27	8.93	.632	.540	.275	.182	628	153000	76900
0850	8.1/2	8.500	8.140		.209		.552	.180	.187		7.977	+.020 −.160	9.78	9.41	.632	.573	.300	.182	700	163000	86500
0900	9	9.000	8.620		.209		.582	.190	.187		8.445		10.25	9.87	No Lugs	.609	.410	.182	756	172000	96700
0950	9.1/2	9.500	9.100		.209		.612	.200	.187		8.915		10.78	10.38		.625	.420	.182	820	181000	107400
1000	10	10.000	9.575		.209		.650	.212	.187		9.385		11.27	10.85	.632	.625	.370	.182	964	191000	120200

STANDARD HEAVY DUTY CIRCLIPS
D1460

Incorporating DIN 471 Table 2

All dimensions in mm



† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft S	Groove (G) G	Tol.	W	Tol.	n (min)	d ~	Circlip (F) t	Tol.	D	Tol.	C	C1	L (max)	b ~	h (min)	Wt. (kg/k)	Tc† (N)	Tg† (N)	SIZE CODE
0120	12	11.5		1.60		0.7	0.25	1.50		11.0		19.3	18.3	3.4	1.8	1.7	0.75	17500	1130	0120
0150	15	14.3		1.60		1.1	0.35	1.50		13.8	+0.10 −0.36	25.1	23.9	4.8	2.0	2.0	1.10	21900	2260	0150
0160	16	15.2	+0.00 −0.11	1.60		1.2	0.40	1.50		14.7		26.5	25.2	5.0	2.5	2.0	1.19	23400	2410	0160
0170	17	16.2		1.60		1.5	0.40	1.50		15.7		27.5	26.2	5.0	2.6	2.0	1.39	24800	3200	0170
0180	18	17.0		1.60		1.5	0.50	1.50	+0.00 −0.06	16.5		28.7	27.2	5.1	2.7	2.0	1.56	26300	4070	0180
0190	19	17.8		1.60		1.8	0.60	1.50		17.5	+0.13 −0.42	29.9	28.2	5.2	2.5	2.0	1.45	27800	4300	0190
0200	20	19.0	+0.00 −0.13	1.85		1.5	0.50	1.75		18.5		31.5	30.0	5.5	3.0	2.0	2.19	34100	4150	0200
0220	22	21.0		1.85		1.5	0.50	1.75		20.5		34.5	33.0	6.0	3.1	2.0	2.42	37500	4980	0220
0230	23	21.8	+0.00 −0.15	1.85		1.8	0.60	1.75		21.3		35.7	34.0	6.1	3.2	2.0	2.60	39200	5200	0230
0240	24	22.9		1.85		1.7	0.55	1.75		22.2		37.1	35.5	6.3	3.2	2.0	2.76	40900	5880	0240
0250	25	23.9		2.15		1.7	0.55	2.00		23.2		38.3	36.7	6.4	3.4	2.0	3.59	48700	6130	0250
0260	26	24.4	+0.00 −0.21	2.15		2.4	0.80	2.00		23.6	+0.21 −0.42	39.7	37.6	6.6	3.3	2.0	3.65	50600	7840	0260
0270	27	25.5		2.15		2.3	0.75	2.00		24.7		40.5	38.5	6.5	3.4	2.0	3.85	52600	7630	0270
0280	28	26.6		2.15		2.1	0.70	2.00		25.9		41.5	39.6	6.5	3.5	2.0	4.25	54500	8440	0280
0290	29	27.6		2.15		2.1	0.70	2.00		26.9		42.5	40.6	6.5	3.8	2.0	4.30	56500	7650	0290
0300	30	28.6		2.15		2.1	0.70	2.00		27.9		43.5	41.6	6.5	4.1	2.0	5.35	58400	9610	0300
0320	32	30.3		2.15		2.6	0.85	2.00		29.6		45.5	43.3	6.5	4.1	2.5	5.85	62300	10200	0320
0330	33	31.3		2.15		2.5	0.85	2.00	+0.00 −0.07	30.5		46.9	44.7	6.7	4.0	2.5	5.20	64300	10600	0330
0340	34	32.3		2.65	+0.14 −0.00	2.6	0.85	2.50		31.5	+0.25 −0.50	47.9	45.7	6.6	4.2	2.5	7.05	82800	12200	0340
0350	35	33.0		2.65		3.0	1.00	2.50		32.2		48.9	46.4	6.7	4.2	2.5	7.20	85200	13200	0350
0360	36	33.8		2.65		3.3	1.10	2.50		33.0		49.9	47.2	6.7	4.2	2.5	7.50	87600	14900	0360
0380	38	36.0	+0.00 −0.25	2.65		3.0	1.00	2.50		35.2		52.1	49.6	6.8	4.3	2.5	8.30	92500	15800	0380
0400	40	37.5		2.65		3.8	1.25	2.50		36.5		55.0	51.5	7.0	4.4	2.5	8.60	80900	18800	0400
0420	42	39.5		2.65		3.8	1.25	2.50		38.5		57.4	53.9	7.2	4.5	2.5	9.30	84900	19800	0420
0450	45	42.5		2.65		3.8	1.25	2.50		41.5	+0.39 −0.90	61.0	57.5	7.5	4.7	2.5	10.70	91000	21200	0450
0480	48	45.5		2.65		3.8	1.25	2.50		44.5		64.6	61.1	7.8	5.0	2.5	11.30	97100	22600	0480
0500	50	47.0		3.15		4.5	1.50	3.00		45.8		67.0	63.0	8.0	5.1	2.5	15.30	121000	28300	0500
0520	52	49.0		3.15		4.5	1.50	3.00		47.8		69.4	65.4	8.2	5.2	2.5	16.60	126000	29400	0520
0550	55	52.0		3.15		4.5	1.50	3.00	+0.00 −0.08	50.8		73.0	69.0	8.5	5.4	2.5	17.10	133000	31100	0550
0580	58	55.0		3.15		4.5	1.50	3.00		53.8		76.6	72.6	8.8	5.6	2.5	18.90	141000	32800	0580
0600	60	57.0	+0.00 −0.30	3.15		4.5	1.50	3.00		55.8		79.0	75.0	9.0	5.8	2.5	19.40	146000	33900	0600
0650	65	62.0		4.15		4.5	1.50	4.00		60.8	+0.46 −1.10	84.6	80.6	9.3	6.3	3.0	29.10	210000	36800	0650
0700	70	67.0		4.15		4.5	1.50	4.00		65.5		90.0	86.0	9.5	6.6	3.0	35.30	226000	39600	0700
0750	75	72.0		4.15		4.5	1.50	4.00		70.5		95.4	91.4	9.7	7.0	3.0	39.30	243000	42400	0750
0800	80	76.5		4.15		5.3	1.75	4.00	+0.00 −0.10	74.5		100.6	96.1	9.8	7.4	3.0	43.70	259000	52800	0800
0850	85	81.5		4.15		5.3	1.75	4.00		79.5		106.0	101.5	10.0	7.8	3.5	48.50	275000	56100	0850
0900	90	86.5	+0.00 −0.35	4.15		5.3	1.75	4.00		84.5		111.4	106.9	10.2	8.2	3.5	59.40	291000	59400	0900
0950	95	91.5		4.15		5.3	1.75	4.00		89.5	+0.54 −1.30	116.6	112.1	10.3	8.6	3.5	61.20	307000	62700	0950
1000	100	96.5		4.15		5.3	1.75	4.00		94.5		122.0	117.5	10.5	9.0	3.5	71.60	324000	66000	1000

Standard material - carbon spring steel. Standard finish - phosphate and oil.

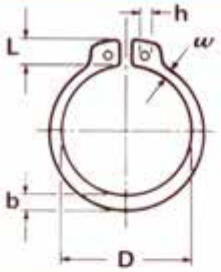
STANDARD HEAVY DUTY CIRCLIPS
N1460

Equivalent to MIL-R-21248/MS 3217

All dimensions in inches
Standard material - carbon spring steel.
Standard finish - phosphate and oil.

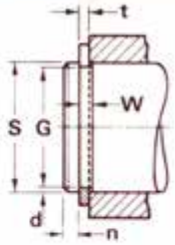
Beam configuration on some larger sizes

† Thrust load calculations see pages 9 & 10



Circlip on shaft

Circlip in groove

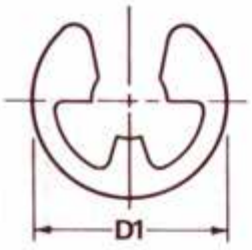


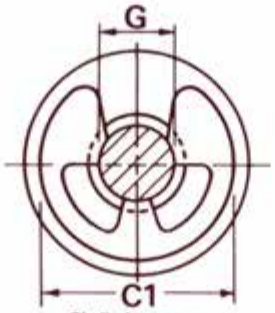
SIZE CODE	Shaft (S)		Groove (G)						Circlip (F)										Wt.	Tc†	Tg†
	S (frac)	S (dec)	G	Tol.	W	Tol.	n (min)	d ~	t	Tol.	D	Tol.	C	C1	L (max)	b ~	w ~	h (min)	(lb/k)	(lb.f)	(lb.f)
0050	1/2	.500	.468	+.001 −.002	.056		.048	.016	.050		.460		.75	.72	.124	.090	.050	.048	1.6	3500	450
0059	—	.591	.555		.056	+.004	.054	.018	.050	±.002	.543		.86	.83	.134	.104	.057	.048	2.2	4180	600
0062	5/8	.625	.588	+.001	.056	−.000	.057	.019	.050		.575	+.005	.90	.86	.134	.106	.060	.048	2.3	4420	670
0066	—	.669	.629	−.003	.056		.060	.020	.050		.616	−.010	.94	.90	.134	.114	.062	.048	2.6	4730	750
0075	3/4	.750	.704		.086		.069	.023	.078		.689		1.12	1.08	.185	.127	.077	.076	5.6	8270	975
0087	7/8	.875	.821		.086		.081	.027	.078		.804		1.25	1.20	.185	.148	.084	.076	7.5	9650	1330
0098	63/64	.984	.925		.086		.090	.030	.078		.906		1.36	1.30	.185	.156	.089	.076	7.8	10800	1670
0098	1	1.000	.938		.086		.093	.031	.078		.906		1.37	1.31	.185	.156	.089	.076	7.8	11000	1750
0106	1.1/16	1.062	.998		.103		.096	.032	.093		.978		1.52	1.46	.225	.163	.092	.091	11.5	14000	1920
0112	1.1/8	1.125	1.059	+.002 −.004	.103	+.005 −.000	.099	.033	.093	±.003	1.036	+.010 −.015	1.58	1.52	.225	.175	.100	.091	12.5	14800	2100
0118	—	1.181	1.111		.103		.105	.035	.093		1.087		1.64	1.57	.225	.176	.098	.091	13.5	15500	2340
0125	1.1/4	1.250	1.174		.103		.114	.038	.093		1.150		1.70	1.63	.225	.185	.103	.091	14.9	16400	2690
0131	1.5/16	1.312	1.234		.103		.117	.039	.093		1.208		1.77	1.69	.225	.196	.110	.091	16.0	17200	2890
0137	1.3/8	1.375	1.291		.103		.126	.042	.093		1.268		1.83	1.75	.225	.200	.110	.091	17.8	18000	3260
0150	1.1/2	1.500	1.406		.120		.141	.047	.109		1.380		1.94	1.84	.215	.205	.105	.107	27.0	19000	3990
0156	1.5/8	1.562	1.468		.120		.141	.047	.109		1.437		2.00	1.90	.215	.205	.110	.098	25.0	20000	4150
0175	1.3/4	1.750	1.650	+.003	.120		.150	.050	.109		1.608	+.013	2.18	2.08	.215	.205	.111	.098	26.5	22500	4950
0193	1.15/16	1.938	1.826	−.004	.139	+.006	.178	.056	.125		1.782	−.020	2.47	2.36	.264	.256	.121	.123	36.6	28500	6140
0200	2	2.000	1.880		.139	−.000	.180	.060	.125	±.004	1.840		2.53	2.41	.265	.256	.122	.123	40.0	29500	6780

STANDARD SERIES 'E' CIRCLIPS
B 1500

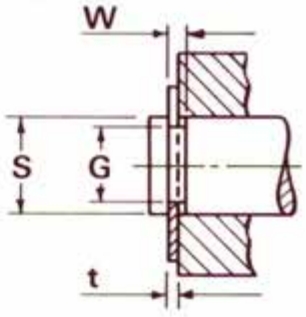
Incorporating BS3673 pt.2MS 16624

All dimensions in inches





Circlip in groove



† Thrust load calculations see pages 9 & 10

SIZE CODE	B.S. Ref.	Shaft (S)		Groove (G)				Circlip (F)				Tc† (lb.f)	Tg† (lb.f)	Appli-cator	Stack-feeda	SIZE CODE
		S	Tol.	G	Tol.	W	Tol.	D1	C1	t	Tol.					
A052	054A1	.062	+.030 −.000	.052		.019		.156	.165	.015		54	6	21A	DR52A	A052
A074	076A1	.094		.074		.024		.187	.200	.020		110	17	2B	DR74A	A074
E079	081A1	.110		.079		.024		.375	.390	.020		130	32	6B	DR79	E079
A095	097A1	.125	+.040 −.000	.095	+.002 −.0005	.024		.230	.240	.020		140	35	3B	DR95A	A095
B095	097A2	.125		.095		.029		.230	.240	.025		180	35	3D	DR95B	B095
A102	104A1	.140		.102		.024	+.0025 −.0000	.203	.215	.020		160	50	17B	DR102A	A102
E116	118PS	.156		.116		.024		.282	.295	.020		180	58	4B	DR116	E116
E125	127A1	.188	+.050 −.000	.125		.019		.310	.330	.015	±.002	160	110	4A	DR125	E125
A125	127A2	.188		.125		.024		.310	.330	.020		220	110	4D	DR125A	A125
X125	127A4	.188		.125		.024		.375	.395	.020		220	110	6B	DR125X	X125
Z125	127A3	.188		.125	+.002 −.001	.019		.375	.395	.015		160	110	AM6	DR125AX	Z125
A147	149A1	.188	+.060 −.000	.147		.024		.335	.350	.020		220	72	5A	DR147A	A147
B147	149A2	.188		.147		.037		.335	.350	.032		350	72	5C	DR147B	B147
A188	190A1	.219	+.100 −.000	.188		.034	+.004 −.000	.437	.450	.030		380	63	8B	FR188A	A188
A210	212A1	.250		.210		.040		.527	.540	.035		500	93	9C	FR210A	A210
A250	252A1	.312		.250		.040		.500	.520	.035		630	180	9C	FR250A	A250

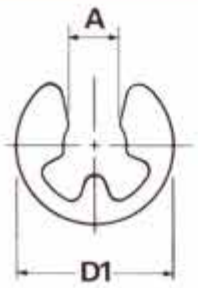
Standard material - carbon spring steel. Standard finish - phosphate and oil.

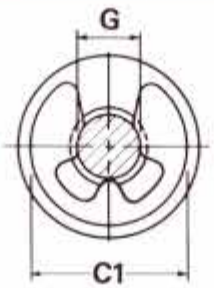
D1500 Incorporating DIN 6799 & BS3673/2 Metric Series
N1500 Incorporating BS3673 pt.2 and MIL-R-21248/MS 16633

All dimensions in mm

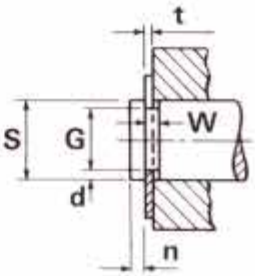
Standard material - carbon spring steel. Standard finish - phosphate and oil.

Sizes printed in blue are preferred sizes





Circlip in groove



D1500 *This size in Beryllium copper only

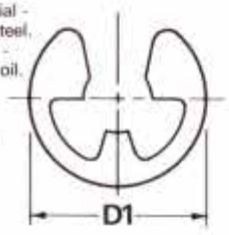
† Thrust load calculations see pages 9 & 10

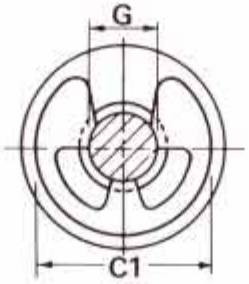
SIZE CODE	B.S. Ref	Shaft (S) S.	Shaft (S) Tol.	Groove (G) G.	Groove (G) Tol.	Groove (G) W.	Groove (G) Tol.	Groove (G) n (min)	Groove (G) d Nom	Circlip (F) t	Circlip (F) Tol.	Circlip (F) D1 ~	Circlip (F) C1	Circlip (F) A	Circlip (F) Tol.	Tc† (N)	Tg† (N)	Applicator	BASE
*0008	008MS	1.20	±0.20	0.8	+0.00 −0.04	0.24	+0.04 −0.00	0.4	0.20	0.20		1.95	2.25	0.58		63	30	–	–
0012	012MS	1.70	±0.30	1.2		0.34		0.6	0.25	0.30		2.90	3.25	1.01		203	53	28	DR 1.2
0015	015MS	2.25	±0.25	1.5	+0.00 −0.06	0.44		0.8	0.38	0.40		3.85	4.25	1.28	±0.04	358	105	21A	DR 1.5
0019	019MS	2.75		1.9		0.54		1.0	0.43	0.50		4.40	4.8	1.61		546	145	22	DR 1.9
0023	023MS	3.50	±0.50	2.3		0.64		1.0	0.60	0.60	±0.02	5.90	6.3	1.94		835	260	3C	DR 2.3
0032	032MS	4.50		3.2		0.64	+0.05 −0.00	1.0	0.65	0.60		6.80	7.3	2.70		1070	365	AM9	DR 3.2
0040	040MS	6.00	±1.00	4.0	+0.00 −0.075	0.74		1.2	1.00	0.70		8.80	9.3	3.34	±0.048	1670	745	23B	DR 4
0050	050MS	7.00		5.0		0.74		1.2	1.00	0.70		10.75	11.3	4.11		1950	870	7B	DR 5
0060	060MS	8.00		6.0		0.74		1.2	1.00	0.70		11.75	12.3	5.26		2220	995	24	DR 6
0070	070MS	9.50	±1.50	7.0		0.94		1.5	1.25	0.90		13.80	14.3	5.84		3400	1480	15	FR 7
0080	080MS	10.50		8.0	+0.00 −0.09	1.05		1.8	1.25	1.00		15.60	16.3	6.52		4170	1630	AM20	FR 8
0090	090MS	12.00	±2.00	9.0		1.15		2.0	1.50	1.10		18.20	18.8	7.63	±0.058	5250	2240	25	FR 9
0100	100MS	13.00		10.0		1.25		2.0	1.50	1.20		19.65	20.4	8.32		6200	2430	26	FR 10
0120	120MS	15.50	±2.50	12.0	+0.00 −0.11	1.35	+0.08 −0.00	2.5	1.75	1.30	±0.03	22.65	23.4	10.45		8010	3370	27	FR 12
0150	150MS	20.00	±4.00	15.0		1.55		3.0	2.50	1.50		28.60	29.4	12.61	±0.07	11900	6220	28B	FR 15
0190	190MS	25.50	±5.50	19.0	+0.00 −0.13	1.85		3.5	3.25	1.75		36.70	37.6	15.92		17700	10300	32A	FR 19
0240	240MS	31.50	±6.50	24.0		2.05		4.0	3.75	2.00		43.65	44.6	21.88	±0.084	25000	14700	–	–

All dimensions in inches

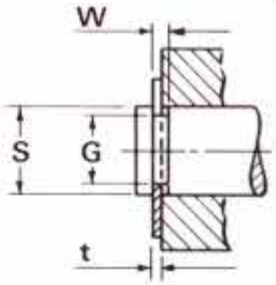
Standard material - carbon spring steel. Standard finish - phosphate and oil.

Sizes printed in blue are preferred sizes





Circlip in groove



N1500

*This size in Beryllium copper only

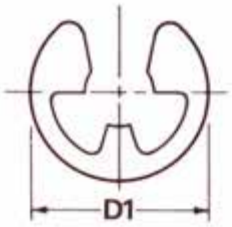
† Thrust load calculations see pages 9 & 10

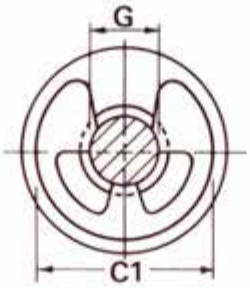
SIZE CODE	B.S. Ref	Shaft (S) S	Shaft (S) Tol.	Groove (G) G	Groove (G) Tol.	Groove (G) W	Groove (G) Tol.	Circlip (F) D1	Circlip (F) C1	Circlip (F) t	Circlip (F) Tol.	Tc† (lb.f)	Tg† (lb.f)	Applicator	Base	SIZE CODE
*X004	028PS	.040	+.010 −.000	.026		.012		.079	.090	.010		15	5	–	–	X004
X006	–	.062		.052		.012		.140	.150	.010	±.001	36	6	AM2	SF2	X006
0006	054PS	.062		.052		.012		.156	.165	.010		36	6	AM3	SF3	0006
Y006	–	.062	+.030	.052		.023		.187	.200	.020		72	6	–	–	Y006
X009	–	.094	−.000	.074		.018	+.002 −.000	.230	.245	.015		81	17	AM7	SF4	X009
0009	076PS	.094		.074		.018		.187	.200	.015		81	17	AM5	SF5	0009
X011	081A2	.110		.079		.018		.375	.390	.015		95	32	AM6	SF6	X011
0012	097PS	.125		.095	+.002 −.000	.018		.230	.240	.015		108	35	AM7	SF7	0012
X014	104PS	.140	+.040	.102		.018		.203	.214	.015		121	50	AM8	SF8	X014
Y014	112A1	.140	−.000	.110		.018		.250	.265	.015		121	39	AM10	SF10	Y014
0014	107A1	.140		.105		.029		.270	.285	.025		202	46	AM9	SF9	0014
0015	118A1	.156	+.050	.116		.029		.282	.295	.025		225	58	AM11	SF11	0015
X017	129PS	.172	−.000	.127		.029		.312	.325	.025		248	72	AM12	SF12	X017
X018	–	.188	+.060	.125		.029		.375	.390	.025		271	110	AM13	SF13	X018
0018	149PS	.188	−.000	.147		.029		.335	.350	.025		271	72	AM14	SF14	0018
X021	190PS	.219		.188		.029		.437	.450	.025	±.002	316	63	AM15	SF15	X021
0025	212PS	.250		.210		.029		.527	.540	.025		361	93	AM16	SF16	0025
X031	252PS	.312	+.100	.250		.029	+.003 −.000	.500	.520	.025		450	180	AM16	SF17	X031
0037	306PS	.375	−.000	.303		.039		.660	.680	.035		757	252	AM18	SF18	0037
0043	346PS	.438		.343		.039		.687	.710	.035		885	388	AM19	SF19	0043
X043	383A1	.438		.380	+.003 −.000	.039		.600	.620	.035		884	237	AM20	SF20	X043
0050	399PS	.500		.396		.046		.800	.820	.042		1210	485	AM21	SF21	0050
0062	488PS	.625		.485		.046		.940	.960	.042		1510	816	AM22	SF22	0062
X074	628A1	.744	+.120	.625		.056		1.000	1.020	.050		2160	1190	AM23	SF23	X074
0075	583PS	.750	−.000	.580		.056		1.120	1.140	.050		2520	1630	AM24	SF24	0075
0087	678PS	.875		.675		.056		1.300	1.320	.050		2840	1370	AM25	SF25	0087
X098	–	.984		.835		.056		1.500	1.530	.050		4250	1210	AM26	SF26	X098
X118	–	1.188	+.200	1.079	+.005 −.000	.068	+.004 −.000	1.626	1.670	.062	±.003	4920	1860	AM27	SF27	X118
X137	–	1.375	−.000	1.230		.068		1.875	1.920	.062		4920	1860	–	–	X137

VARIANTS OF SERIES 'E' CIRCLIPS
N1501 (Bowed)

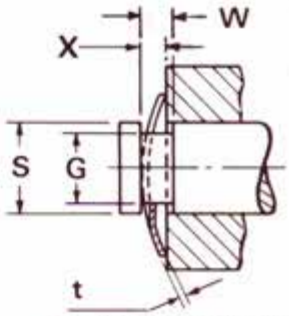
Equivalent to MIL-R-21248/MS 16634

All dimensions in inches





Circlip in groove



E = Max. end play take up capability

† Thrust load calculations see pages 9 & 10

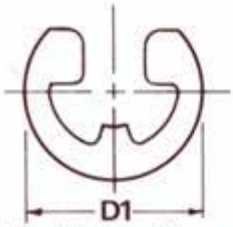
SIZE CODE	Shaft(S) S	Shaft(S) Tol.	Groove (G) G	Groove (G) Tol.	Groove (G) W	Groove (G) Tol.	Circlip (F) D1	Circlip (F) C1	Circlip (F) t	Circlip (F) Tol.	Tc† (lb.f)	Tg† (lb.f)	E	X (Min)	X (Max)	Appli-cator	SIZE CODE
0009	.094	+.030 −.000	.074		.045		.187	.200	.020	±.002	108	17	.010	.025	.035	AM 5W	0009
X011	.110		.079		.035		.375	.390	.015		95	32	.013	.020	.033	AM 6W	X011
0012	.125	+.040 −.000	.095		.022		.230	.240	.010	±.0015	72	35	.007	.014	.021	AM 7	0012
X014	.140		.102		.019		.203	.215	.010		81	50	.004	.014	.018	AM 8	X014
0014	.140		.105	+.002 −.000	.025		.270	.285	.015		121	46	.003	.020	.023	AM 9W	0014
0015	.156	+.050 −.000	.116		.027		.282	.295	.015		135	58	.005	.020	.025	AM11	0015
X017	.172		.127		.029		.312	.325	.015		149	72	.007	.020	.027	AM12	X017
X018	.188	+.060 −.000	.125		.035		.375	.390	.015		163	110	.013	.020	.033	AM13W	X018
0018	.188		.147		.030		.335	.350	.015		163	72	.008	.020	.028	AM14	0018
X021	.219		.188		.040	+.003 −.000	.437	.450	.015		190	63	.018	.020	.038	AM15W	X021
0025	.250		.210		.049		.527	.540	.025		361	93	.015	.032	.047	9C	0025
X031	.311	+.100 −.000	.250		.047		.500	.520	.025		449	177	.013	.032	.045	9C	X031
0037	.374		.303		.060		.660	.680	.035	±.002	755	248	.016	.042	.058	AM18W	0037
0043	.437		.343		.060		.687	.710	.035		883	383	.016	.042	.058	AM19W	0043
X043	.437		.380	+.003 −.000	.057		.600	.620	.035		883	232	.013	.042	.055	AM20W	X043
0050	.500		.396		.073		.800	.820	.042		1210	485	.022	.049	.071	AM21W	0050
0062	.625		.485		.077		.940	.960	.042		1510	816	.026	.049	.075	AM22W	0062
X074	.744		.625		.085		1.000	1.020	.050		2150	826	.026	.057	.083	AM23W	X074
0075	.748	+.120 +.000	.580		.085		1.120	1.140	.050		2160	1170	.026	.057	.083	AM24W	0075
0087	.874		.675		.085		1.300	1.320	.050		2520	1620	.026	.057	.083	AM25W	0087
X098	.984		.835		.085		1.500	1.530	.050		2840	1370	.026	.057	.083	AM26W	X098
X118	1.188		1.079	+.005 −.000	.107	+.004 −.000	1.626	1.670	.062	±.003	4250	1210	.034	.070	.104	—	X118
X137	1.375		1.230		.107		1.875	1.920	.062		4920	1860	.034	.070	.104	—	X137

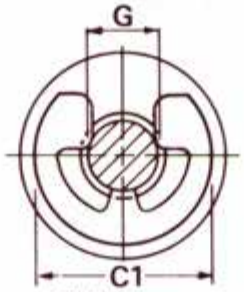
Standard material - carbon spring steel. Standard finish - phosphate and oil.

VARIANTS OF SERIES 'E' CIRCLIPS
N1540 (Reinforced)

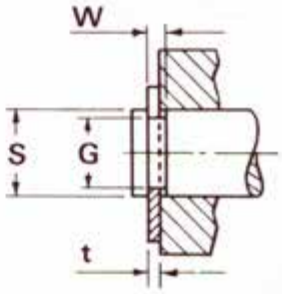
Equivalent to MIL-R-21248/MS 3215

All dimensions in inches





Circlip in groove



† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft (S) S	Shaft (S) Tol.	Groove (G) G	Groove (G) Tol.	Groove (G) W	Groove (G) Tol.	Circlip (F) D1	Circlip (F) C1	Circlip (F) t	Circlip (F) Tol.	Tc† (lb.f)	Tg† (lb.f)	Appli-cator	Base	SIZE CODE
0009	.094	+.015 −.000	.074		.018	+.002 −.000	.206	.219	.015		80	17	AM8	SF30	0009
0012	.125		.095	+.002 −.000	.018		.270	.283	.015		110	35	AM31	SF31	0012
0015	.156		.116		.029		.335	.350	.025		220	58	AM14	SF32	0015
0018	.188	+.050 −.000	.147		.029		.375	.390	.025		270	72	AM33	SF33	0018
0021	.219		.188	±.002	.029		.446	.460	.025		320	63	AM15	SF34	0021
0025	.250		.210		.029	+.003 −.000	.516	.530	.025	±.002	360	93	AM16	SF35	0025
0031	.312		.250		.039		.588	.610	.035		630	180	AM20	SF36	0031
0037	.375		.303		.039		.660	.680	.035		760	250	AM18	SF37	0037
0043	.438		.343	±.003	.039		.746	.777	.035		880	390	AM38	SF38	0043
0050	.500	+.100 −.000	.396		.046		.810	.830	.042		1210	480	AM21	SF39	0050
0056	.562		.437		.046		.870	.890	.042		1360	650	AM40	SF40	0056

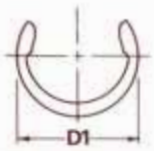
Standard material - carbon spring steel. Standard finish - phosphate and oil.

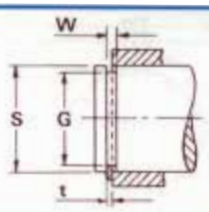
VARIANTS OF SERIES 'E' CIRCLIPS
N1800

Incorporating BS3673.3
Equivalent to MIL-R-21248/MS 16632

All dimensions in inches

† Thrust load calculations see pages 9 & 10



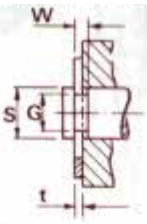


SIZE CODE	B.S. Ref.	Shaft (S) S	Shaft (S) Tol.	Groove (G) G	Groove (G) Tol.	Groove (G) W	Groove (G) Tol.	Circlip (F) D1	Circlip (F) C1	Circlip (F) t	Circlip (F) Tol.	Tc† (lb.f)	Tg† (lb.f)	Appli-cator	Base	SIZE CODE
0012	C0012	.125	+.003 −.000	.106	±.0015	.018	+.002 −.000	.165	.18	.015		123	34	AM50	SF50	0012
0015	C0015	.156		.135		.018		.205	.22	.015		153	46	AM8	SF51	0015
0018	C0018	.188		.165		.018		.244	.25	.015		185	61	AM10	SF52	0018
0021	C0021	.219		.193		.029		.275	.29	.025		359	80	AM53	SF53	0021
0023	C0023	.236		.208		.029		.295	.31	.025		387	93	AM54	SF54	0023
0025	C0025	.250	+.004 −.000	.220	±.002	.029		.311	.33	.025		410	106	AM12	SF55	0025
0028	C0028	.281		.247		.029		.346	.36	.025		461	135	AM56	SF56	0028
0031	C0031	.312		.276		.029		.376	.39	.025		511	159	AM13	SF57	0031
0037	C0037	.375		.335		.029		.448	.47	.025		615	212	AM58	SF58	0037
0040	C0040	.406		.364		.029		.486	.50	.025		665	241	AM59	SF59	0040
0043	C0043	.438	+.006 −.000	.393	±.003	.029	+.003 −.000	.517	.53	.025	±.002	718	279	AM16	SF60	0043
0050	C0050	.500		.450		.039		.581	.60	.035		1150	353	AM61	SF61	0050
0056	C0056	.562		.507		.039		.653	.67	.035		1290	437	AM18	SF62	0056
0062	C0062	.625		.563		.039		.715	.74	.035		1430	548	AM38	SF63	0062
0068	C0068	.688		.619		.046		.784	.80	.042		1890	671	AM64	SF64	0068
0075	C0075	.750		.676		.046		.845	.87	.042		2070	785	AM40	SF65	0075
0081	C0081	.812		.732		.046		.915	.94	.042		2240	918	AM66	SF66	0081
0087	C0087	.875		.789		.046		.991	1.01	.042		2410	1060	AM67	SF67	0087
0093	C0093	.938		.843		.046		1.058	1.08	.042		2580	1260	AM68	SF68	0093
0100	C0100	1.000		.900		.046		1.130	1.15	.042		2750	1410	AM69	SF69	0100
0112	—	1.125	+.008 −.000	1.013	±.004	.056	+.004 −.000	1.267	1.30	.050		3690	1780	—	—	0112
0118	—	1.188		1.047		.056		1.321	1.35	.050		3890	2370	—	—	0118
0125	—	1.250		1.126		.056		1.415	1.44	.050		4100	2190	—	—	0125
0137	—	1.375		1.237		.056		1.555	1.58	.050		4510	2680	—	—	0137
0150	—	1.500		1.350		.056		1.691	1.72	.050		4920	3180	—	—	0150
0175	—	1.750	+.010 −.000	1.576	±.005	.068		1.975	2.01	.062	±.003	7110	4300	—	—	0175
0200	—	2.000		1.800		.068		2.257	2.30	.062		8130	5650	—	—	0200

Standard material - carbon spring steel. Standard finish - phosphate and oil.

A1500 'U', 'C' & 'S'

All dimensions in inches



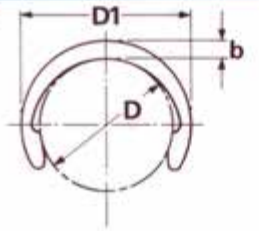
† Thrust load calculations see pages 9 & 10

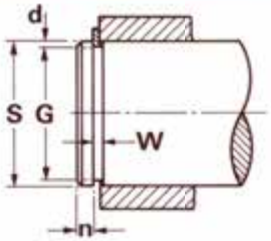
SIZE CODE	Shaft (S) S	Shaft (S) Tol.	Groove (G) G	Groove (G) Tol.	Groove (G) W	Groove (G) Tol.	Circlip (F) D1	Circlip (F) C1	Circlip (F) t	Circlip (F) Tol.	Tc† (lb.f)	Tg† (lb.f)	Appli-cator	Base	SIZE CODE
U078	.110	+.040 −.000	.078	+.002 −.000	.023	+.003 −.000	.426	.430	.020	±.0015	231	60	8D	DR78U	U078
U095	.125		.095		.023		.374	.380	.020		262	64	4B	DR95U	U095
U125	.172		.125		.023		.500	.510	.020		361	137	6B	SR125U	U125
U187	.218	+.100 −.000	.187		.023		.688	.700	.020		457	115	29	SR187U	U187
U281	.343		.281		.023		.780	.790	.020		720	361	10A	FR281U	U281
C086	.110	+.040 −.000	.086	+.002 −.000	.025	+.002 −.000	.282	.297	.022	±.002	289	45	4B	QL86C	C086
C120	.156		.120		.027		.320	.336	.024		393	95	AM14	FR120C	C120
C124	.156		.124		.017		.406	.422	.015	±.0015	245	85	7A	QL124C	C124
C175	.218	+.100 −.000	.175		.017		.500	.517	.015		343	159	9A	FR175C	C175
C181	.218		.181		.031		.430	.447	.028	±.002	640	137	AM15	FR181C	C181
C249	.312		.249		.017		.625	.642	.015	±.0015	491	333	16A	FR249C	C249
S052	.078	+.030 −.000	.052	+.002 −.000	.017	+.002 −.000	.250	.265	.015	±.0015	123	34	AM10	DR52S	S052
S062	.078		.062		.028		.295	.305	.025		205	21	AM11	DR62S	S062
S091	.125		.091		.025		.281	.291	.022		289	72	4B	DR91S	S091
S102	.125	+.060 −.000	.102		.017		.376	.391	.015		197	49	AM6	DR102S	S102
S120	.156		.120		.027		.320	.336	.024		393	95	AM14	DR120S	S120
S126	.188	+.075 −.000	.126	+.003 −.000	.027	+.003 −.000	.350	.365	.024	±.002	473	198	AM56	DR126S	S126
S389	.468		.389		.031		.687	.705	.028		1375	627	12A	—	S389

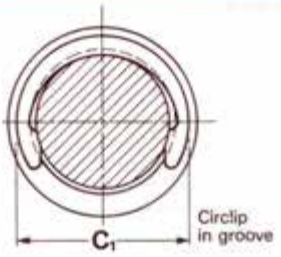
Standard material - carbon spring steel. Standard finish - phosphate and oil.

VARIANTS OF SERIES 'E' CIRCLIPS
M1800

All dimensions in mm



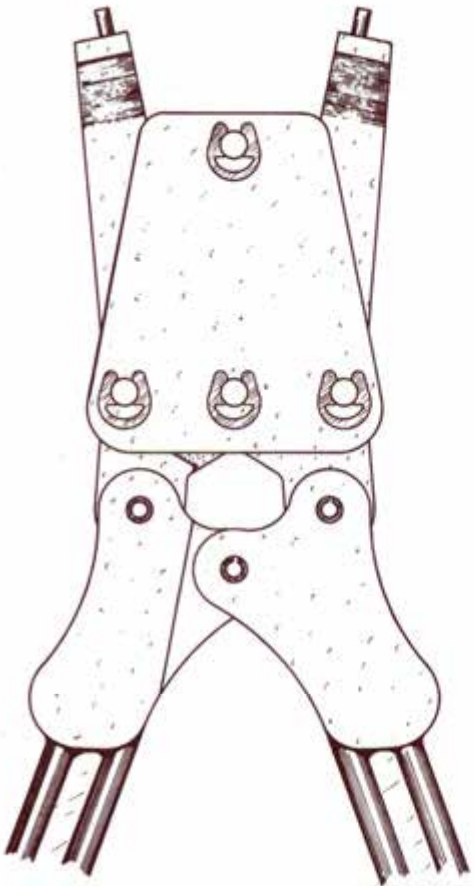


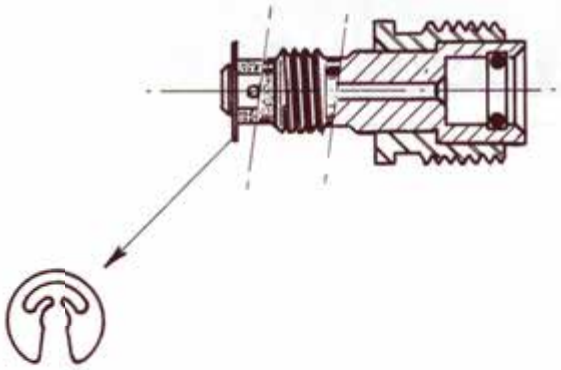


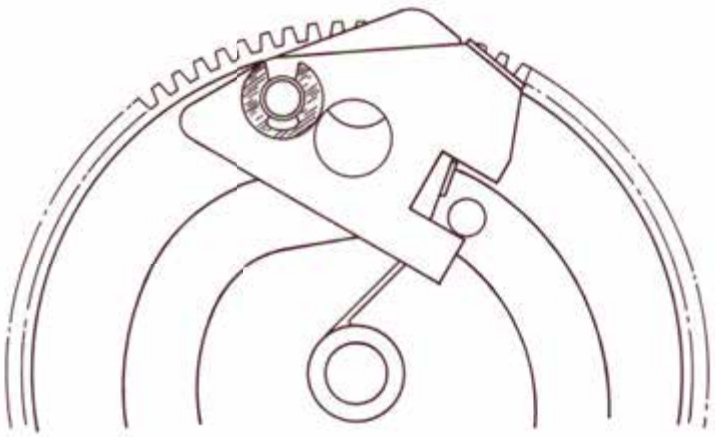
† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft (S) S	Tol.	Groove (G) G	Tol.	W	Tol.	d	n	Cirdip (F) t	Tol.	D	Tol.	D1	b	C1	Wt. kg/k	Tc† (N)	Tg† (N)	SIZE CODE
0030	3	+0.08 −0.00	2.3	+0.00 −0.07	0.44	+0.05 −0.00	0.35	1.0	0.40	+0.00 −0.05	2.18	±0.06	3.96	0.90	4.1	0.02	500	240	0030
0040	4		3.2		0.44		0.40	1.2	0.40		3.00		5.00	1.00	5.2	0.04	500	370	0040
0050	5		4.0		0.64		0.50	1.5	0.60		3.80	±0.08	6.20	1.20	6.4	0.08	1100	580	0050
0060	6		5.0		0.74		0.50	1.5	0.70		4.80		7.40	1.30	7.6	0.11	1650	720	0060
0065	6.5		5.8		0.74		0.35	1.0	0.70		5.60		8.20	1.30	8.4	0.12	1700	550	0065
0070	7	+0.10 −0.00	6.0	+0.00 −0.09	0.85		0.50	1.5	0.80		5.80		8.60	1.40	8.8	0.13	2200	850	0070
0080	8		7.0		0.85		0.50	1.5	0.80		6.80	±0.09	10.00	1.60	10.2	0.17	2200	960	0080
0090	9		8.0		1.10		0.50	1.5	1.00		7.80		11.20	1.70	11.4	0.22	3500	1100	0090
0100	10		9.0		1.10	+0.08 −0.00	0.50	1.5	1.00		8.75		12.15	1.70	12.4	0.26	3700	1240	0100
0110	11		10.0		1.10		0.50	1.5	1.00		9.65		13.20	1.80	13.6	0.29	4000	1350	0110
0120	12	+0.15 −0.00	10.9	+0.00 −0.11	1.10		0.55	1.7	1.00		10.55	±0.18	14.35	1.90	14.7	0.32	4200	1650	0120
0130	13		11.8		1.10		0.60	1.8	1.00		11.40		15.40	2.00	15.8	0.36	4500	1900	0130
0140	14		12.7		1.10		0.65	2.0	1.00		12.30		16.30	2.00	16.7	0.40	5000	2200	0140
0150	15		13.6		1.10		0.70	2.1	1.00		13.20		17.40	2.10	17.8	0.46	5500	2600	0150
0160	16		14.5		1.10		0.75	2.3	1.00		14.10		18.50	2.20	18.9	0.54	5800	3000	0160
0170	17		15.4		1.10		0.80	2.4	1.00	+0.00 −0.06	14.90		19.40	2.25	19.9	0.64	6000	3400	0170
0180	18		16.3		1.30		0.85	2.6	1.20		15.80		20.40	2.30	20.9	0.72	8500	3700	0180
0190	19		17.2		1.30		0.90	2.7	1.20		16.70		21.50	2.40	22.0	0.80	9000	4300	0190
0200	20		18.1		1.30		0.95	2.9	1.20		17.55		22.65	2.55	23.2	0.87	9400	4700	0200
0220	22		19.9		1.30		1.05	3.2	1.20		19.40		25.00	2.80	25.5	1.10	10000	5700	0220
0230	23		20.8	+0.00 −0.21	1.30	+0.15 −0.00	1.10	3.3	1.20		20.20	±0.21	26.00	2.90	26.6	1.15	10500	6200	0230
0240	24		21.7		1.30		1.15	3.5	1.20		21.10		27.10	3.00	27.7	1.52	11000	6800	0240
0250	25		22.6		1.30		1.20	3.6	1.20		22.00		28.30	3.15	28.9	1.74	11500	7500	0250
0260	26	+0.20 −0.00	23.5		1.30		1.25	3.8	1.20		22.90		29.40	3.25	30.0	1.88	12000	8000	0260
0280	28		25.2		1.60		1.40	4.2	1.50		24.60		31.60	3.50	32.2	2.32	16500	9700	0280
0300	30		27.0		1.60		1.50	4.5	1.50		26.30		33.70	3.70	34.4	2.43	17000	11000	0300

Standard material - carbon spring steel. Standard finish - phosphate and oil.



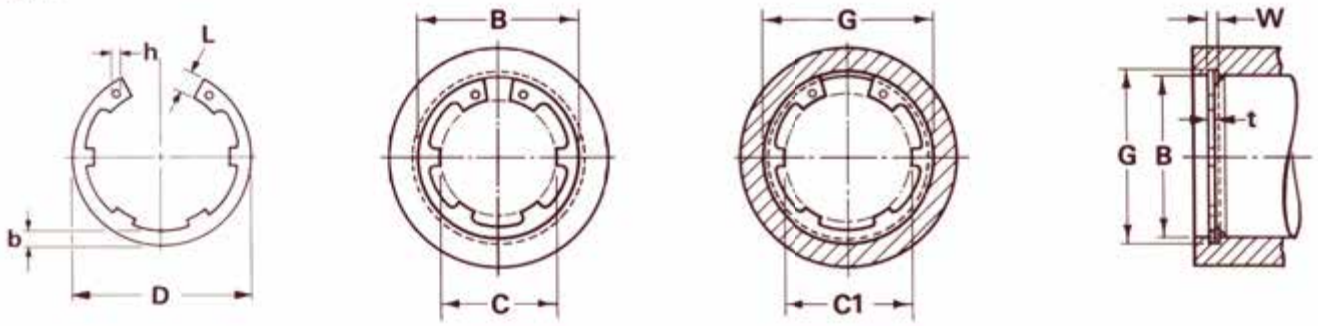




CIRCLIPS WITH INCREASED ABUTMENT
D2000

Incorporating DIN 984

All dimensions in mm



Circlip in bore

Crclip in groove

† Thrust load calculations see pages 9 & 10

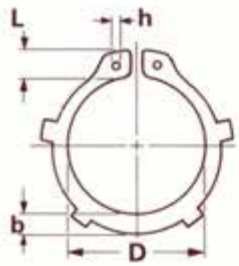
SIZE CODE	Bore (B)	Groove (G)						Crclip (F)									Tc†	Tg†	SIZE CODE
	B	G	Tol	W	Tol	n (min)	d ~	t	Tol	D	Tol	C	C1	L (max)	b ~	h (min)	(N)	(N)	
0160	16	16.8	+0.11 −0.00	1.10		1.2	.040	1.00		17.3		9.0	10.0	3.4	2.1	1.7	15600	2410	0160
0170	17	17.8		1.10		1.2	.040	1.00		18.3		9.4	10.4	3.7	2.2	1.7	16600	2560	0170
0180	18	19.0		1.10		1.5	.050	1.00		19.5		9.6	10.8	4.1	2.3	2.0	17500	3390	0180
0190	19	20.0	+0.15 −0.00	1.10		1.5	.050	1.00		20.5	+0.42 −0.13	11.2	12.4	3.8	2.3	2.0	18500	3580	0190
0200	20	21.0		1.10		1.5	.050	1.00		21.5		12.0	13.2	3.9	2.4	2.0	19500	3770	0200
0210	21	22.0		1.10		1.5	.050	1.00		22.5		12.8	14.0	4.0	2.4	2.0	20400	3960	0210
0220	22	23.0		1.10		1.5	.050	1.00		23.5		13.8	15.0	4.0	2.6	2.0	21400	4150	0220
0230	23	24.1		1.30		1.6	.055	1.20		24.6		14.6	15.9	4.1	2.6	2.0	26900	4770	0230
0240	24	25.2	+0.21 −0.00	1.30		1.8	.060	1.20		25.9	+0.42 −0.21	15.4	16.8	4.2	2.6	2.0	28000	5430	0240
0250	25	26.2		1.30		1.8	.060	1.20		26.9		16.0	17.4	4.4	2.8	2.0	29200	5650	0250
0260	26	27.2		1.30		1.8	.060	1.20		28.5		17.0	18.4	4.4	2.8	2.0	30400	5880	0260
0270	27	28.4		1.30		2.1	.070	1.20		29.1		17.8	19.4	4.5	2.9	2.0	31600	7130	0270
0280	28	29.4		1.30		2.1	.070	1.20		30.1		18.0	19.6	4.9	3.0	2.0	32700	7390	0280
0300	30	31.4		1.30		2.1	.070	1.20	+0.00 −0.06	32.1		20.0	21.6	4.9	3.2	2.0	35100	7920	0300
0310	31	32.7		1.30		2.5	.085	1.20		33.4		20.8	22.7	5.0	3.2	2.5	36200	9930	0310
0320	32	33.7		1.30		2.5	0.85	1.20		34.4		21.5	23.5	5.1	3.3	2.5	37400	10300	0320
0330	33	34.7		1.30		2.5	0.85	1.20		35.5	+0.50 −0.25	22.5	24.5	5.1	3.3	2.5	38600	10600	0330
0340	34	35.7		1.60		2.5	0.85	1.50		36.5		23.1	25.1	5.3	3.4	2.5	49700	10900	0340
0350	35	37.0	+0.25 −0.00	1.60	+0.14 −0.00	3.0	1.00	1.50		37.8		23.7	26.0	5.5	3.6	2.5	51100	13200	0350
0360	36	38.0		1.60		3.0	1.00	1.50		38.8		24.5	26.8	5.6	3.6	2.5	52600	13600	0360
0380	38	40.0		1.60		3.0	1.00	1.50		40.8		25.5	27.8	6.1	3.8	2.5	55500	14300	0380
0400	40	42.5		1.85		3.8	1.25	1.75		43.5		25.2	28.1	7.2	4.0	2.5	56800	18800	0400
0420	42	44.5		1.85		3.8	1.25	1.75		45.5	+0.90 −0.39	27.2	30.1	7.2	4.1	2.5	59500	19800	0420
0440	44	46.5		1.85		3.8	1.25	1.75		47.5		29.3	32.1	7.2	4.2	2.5	62300	20700	0440
0450	45	47.5		1.85		3.8	1.25	1.75		48.5		30.3	33.1	7.2	4.3	2.5	63700	21200	0450
0470	47	49.5		1.85		3.8	1.25	1.75		50.5		32.3	35.1	7.2	4.5	2.5	66500	22100	0470
0480	48	50.5		1.85		3.8	1.25	1.75		51.5		33.3	36.1	7.2	4.5	2.5	68000	22600	0480
0500	50	53.0		2.15		4.5	1.50	2.00		54.2		33.3	36.6	8.2	4.7	2.5	80900	28300	0500
0520	52	55.0		2.15		4.5	1.50	2.00		56.2		35.2	38.6	8.2	4.7	2.5	84100	29400	0520
0550	55	58.0		2.15		4.5	1.50	2.00		59.2		38.2	41.6	8.2	5.1	2.5	89000	31100	0550
0570	57	60.0		2.15		4.5	1.50	2.00		61.2		40.2	43.6	8.2	5.2	2.5	92200	32200	0570
0580	58	61.0	+0.30 −0.00	2.15		4.5	1.50	2.00		62.2	+1.10 −0.46	41.2	44.6	8.2	5.3	2.5	93800	32800	0580
0600	60	63.0		2.15		4.5	1.50	2.00	+0.00 −0.07	64.2		43.2	46.6	8.2	5.5	2.5	97100	33900	0600
0620	62	65.0		2.15		4.5	1.50	2.00		66.2		45.2	48.6	8.2	5.6	2.5	100000	35100	0620
0650	65	68.0		2.65		4.5	1.50	2.50		69.2		44.1	47.6	10.2	5.8	3.0	131000	36800	0650
0670	67	70.0		2.65		4.5	1.50	2.50		71.5		46.1	49.6	10.2	6.0	3.0	136000	37900	0670
0680	68	71.0		2.65		4.5	1.50	2.50		72.5		47.1	50.6	10.2	6.1	3.0	138000	38500	0680
0700	70	73.0		2.65		4.5	1.50	2.50		74.5		49.1	52.6	10.2	6.2	3.0	142000	39600	0700
0720	72	75.0		2.65		4.5	1.50	2.50		76.5		51.1	54.6	10.2	6.4	3.0	146000	40700	0720
0750	75	78.0		2.65		4.5	1.50	2.50		79.5		54.1	57.6	10.2	6.6	3.0	152000	42400	0750
0800	80	83.5		2.65		5.3	1.75	2.50		85.5		59.1	63.1	10.2	7.0	3.0	162000	52800	0800
0850	85	88.5		3.15		5.3	1.75	3.00		90.5		60.1	64.1	12.2	7.4	3.5	206000	56100	0850
0900	90	93.5	+0.35 −0.00	3.15	+0.18 −0.00	5.3	1.75	3.00		95.5		65.1	69.1	12.2	7.7	3.5	218000	59400	0900
0950	95	98.5		3.15		5.3	1.75	3.00	+0.00 −0.08	100.5	+1.30 −0.54	70.1	74.1	12.2	8.1	3.5	231000	62700	0950
1000	100	103.5		3.15		5.3	1.75	3.00		105.5		75.1	79.1	12.2	8.5	3.5	243000	66000	1000
1100	110	114.0	+0.54 −0.00	4.15		6.0	2.00	4.00	+0.00 −0.10	117.0		85.1	89.6	12.2	9.0	3.5	256000	82900	1100

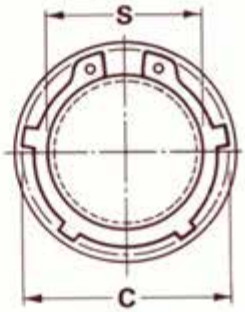
Standard material - carbon spring steel. Standard finish - phosphate and oil.

CIRCLIPS WITH INCREASED ABUTMENT
D2100

Incorporating DIN 983

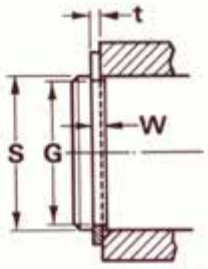
All dimensions in mm





Circlip on shaft

Circlip in groove



† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft (S)	Groove (G)						Circlip (F)									Tc†	Tg†	SIZE CODE
	S	G	Tol	W	Tol	n (min)	d ~	t	Tol	D	Tol	C	C1	L (max)	b ~	h (min)	(N)	(N)	
0160	16	15.2	+0.00 −0.11	1.10		1.2	0.40	1.00		14.7	+0.10 −0.36	23.2	22.2	3.5	2.3	1.7	15600	2410	0160
0170	17	16.2		1.10		1.2	0.40	1.00		15.7		24.4	23.4	3.6	2.4	1.7	16600	2560	0170
0180	18	17.0		1.30		1.5	0.50	1.20		16.5		25.6	24.4	3.7	2.5	2.0	21000	3390	0180
0190	19	18.0		1.30		1.5	0.50	1.20		17.5		26.6	25.4	3.7	2.6	2.0	22200	3580	0190
0200	20	19.0		1.30		1.5	0.50	1.20		18.5	+0.13 −0.42	27.8	26.6	3.8	2.6	2.0	23400	3770	0200
0220	22	21.0		1.30		1.5	0.50	1.20		20.5		30.2	29.0	4.0	2.8	2.0	25700	4150	0220
0230	23	22.0		1.30		1.5	0.50	1.20		21.5		31.4	30.2	4.1	2.9	2.0	26900	4340	0230
0240	24	22.9	+0.00 −0.21	1.30		1.6	0.55	1.20		22.2		32.6	31.3	4.2	3.0	2.0	28000	4980	0240
0250	25	23.9		1.30		1.6	0.55	1.20		23.2		33.8	32.5	4.3	3.0	2.0	29200	5180	0250
0260	26	24.9		1.30		1.6	0.55	1.20		24.2		35.0	33.7	4.4	3.1	2.0	30400	5390	0260
0280	28	26.6		1.60		2.1	0.70	1.50	+0.00 −0.06	25.9	+0.21 −0.42	37.3	35.6	4.5	3.3	2.0	40900	7390	0280
0290	29	27.6		1.60		2.1	0.70	1.50		26.9		38.7	37.0	4.7	3.4	2.0	42400	7650	0290
0300	30	28.5		1.60		2.1	0.70	1.50		27.9		39.7	37.9	4.7	3.4	2.0	43800	7920	0300
0320	32	30.3		1.60		2.5	0.85	1.50		29.6		42.4	40.3	5.0	3.6	2.5	46700	10300	0320
0340	34	32.3		1.60		2.5	0.85	1.50		31.5		44.6	42.5	5.1	3.8	2.5	49700	10900	0340
0350	35	33.0		1.60		3.0	1.00	1.50		32.2		45.8	43.4	5.2	3.8	2.5	51100	13200	0350
0370	37	35.0		1.85	+0.14 −0.00	3.0	1.00	1.75		34.2	+0.25 −0.50	48.2	45.8	5.4	4.0	2.5	51400	13600	0370
0380	38	36.0	+0.00 −0.25	1.85		3.0	1.00	1.75		35.2		49.4	47.0	5.5	4.1	2.5	54800	14300	0380
0400	40	37.5		1.85		3.8	1.25	1.75		36.5		54.9	51.9	7.2	4.2	2.5	56600	18800	0400
0420	42	39.5		1.85		3.8	1.25	1.75		38.5		56.9	53.9	7.2	4.5	2.5	59500	19800	0420
0450	45	42.5		1.85		3.8	1.25	1.75		41.5	+0.39 −0.90	59.9	56.9	7.2	4.6	2.5	63700	21200	0450
0470	47	44.5		1.85		3.8	1.25	1.75		43.5		61.9	58.9	7.2	4.8	2.5	66500	22100	0470
0480	48	45.5		1.85		3.8	1.25	1.75		44.5		62.9	59.9	7.2	4.9	2.5	67900	22600	0480
0500	50	47.0		2.15		4.5	1.50	2.00		45.8		67.0	63.4	8.2	5.0	2.5	80900	28300	0500
0550	55	52.0		2.15		4.5	1.50	2.00		50.8		72.0	68.4	8.2	5.4	2.5	89000	31100	0550
0570	57	54.0		2.15		4.5	1.50	2.00		52.8		74.0	70.4	8.2	5.6	2.5	90600	31700	0570
0580	58	55.0		2.15		4.5	1.50	2.00		53.8		75.0	71.4	8.2	5.7	2.5	93800	32800	0580
0600	60	57.0		2.15		4.5	1.50	2.00		55.8		77.0	73.4	8.2	5.8	2.5	97100	33900	0600
0620	62	59.0	+0.00 −0.30	2.15		4.5	1.50	2.00	+0.00 −0.07	57.8	+0.46 −1.10	79.0	75.4	8.2	5.9	2.5	100000	35100	0620
0650	65	62.0		2.65		4.5	1.50	2.50		60.8		86.0	82.4	10.2	6.2	3.0	131000	36800	0650
0670	67	64.0		2.65		4.5	1.50	2.50		62.5		88.0	84.4	10.2	6.4	3.0	136000	37900	0670
0680	68	65.0		2.65		4.5	1.50	2.50		63.5		89.0	85.4	10.2	6.5	3.0	138000	38500	0680
0700	70	67.0		2.65		4.5	1.50	2.50		65.5		91.0	87.4	10.2	6.6	3.0	142000	39600	0700
0750	75	72.0		2.65		4.5	1.50	2.50		70.5		96.2	92.4	10.2	7.0	3.0	152000	42400	0750
0800	80	76.5		2.65		5.3	1.75	2.50		74.5		101.2	96.9	10.2	7.4	3.0	162000	52800	0800
0850	85	81.5		3.15		5.3	1.75	3.00		79.5		106.2	101.9	10.2	7.8	3.5	206000	56100	0850
0900	90	86.5	+0.00 −0.35	3.15	+0.18 −0.00	5.3	1.75	3.00	+0.00 −0.08	84.5	+0.54 −1.30	111.2	106.9	10.2	8.2	3.5	218000	59400	0900
0950	95	91.5		3.15		5.3	1.75	3.00		89.5		116.2	111.9	10.2	8.6	3.5	231000	62700	0950
1000	100	96.5		3.15		5.3	1.75	3.00		94.6		121.4	116.9	10.2	9.0	3.5	243000	66000	1000
1100	110	106.0	+0.00 −0.54	4.15		6.0	2.00	4.00	+0.00 −0.10	103.0		135.4	130.4	12.2	9.6	3.5	356000	82900	1100

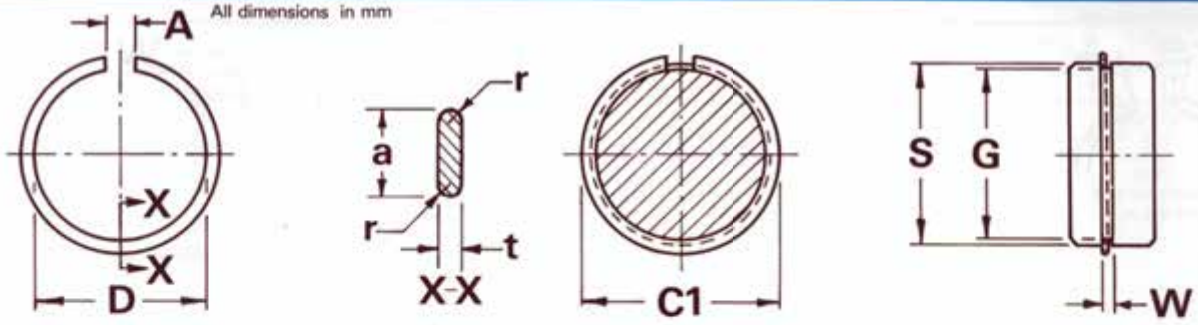
Standard material - carbon spring steel. Standard finish - phosphate and oil.

PLAIN EXTERNAL RINGS FOR BEARING RETENTION

M3200

Incorporating DIN 5417

All dimensions in mm



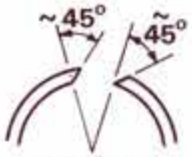
† Thrust load calculations see pages 9 & 10

SIZE CODE	Brg.	Groove (G)				Circlip (F)									Tc†	Bearing No.		
	S	G	Tol	W	Tol	D	Tol	a	Tol	t	Tol	C1	A~	r (min)	(N)	Light	Medium	Heavy
0300	30	28.17		1.35		27.4		3.25		1.12		34.7	3	0.4	23000	6200	–	–
0320	32	30.15		1.35		29.4	+0.40	3.25		1.12		36.7	3	0.4	24500	6201	–	–
0350	35	33.17		1.35		32.4	−0.00	3.25		1.12		39.7	3	0.4	26800	6202	6300	–
0370	37	34.77		1.35		34.0		3.25		1.12		41.3	3	0.4	28300	–	6301	–
0400	40	38.10		1.35		37.3		3.25		1.12		44.6	3	0.4	30600	6203	–	–
0420	42	39.75		1.35		38.9		3.25		1.12		46.3	3	0.4	32100	–	6302	
0440	44	41.75	+0.00	1.35		40.9		3.25		1.12		48.3	3	0.4	33700	–	–	–
0470	47	44.60	−0.25	1.35		43.7	+0.50	4.04		1.12		52.7	4	0.4	36000	6204	6303	–
0500	50	47.60		1.35		46.7	−0.00	4.04		1.12		55.7	4	0.4	38300	–	–	–
0520	52	49.73		1.35		48.8		4.04		1.12		57.9	4	0.4	40000	6205	6304	–
0550	55	52.60		1.35		51.7		4.04		1.12		60.7	4	0.4	42100	–	–	–
0560	56	53.60		1.35		52.4		4.04		1.12		61.7	4	0.4	42900	–	–	–
0580	58	55.60		1.35		54.4		4.04		1.12		63.7	4	0.4	44400	–	–	–
0620	62	59.61		1.90		58.2		4.04		1.70		67.7	4	0.6	72000	6206	6305	6403
0650	65	62.60		1.90		61.2		4.04		1.70		70.7	4	0.6	75500	–	–	–
0680	68	64.82		1.90		63.4	+0.80	4.85		1.70		74.6	5	0.6	79000	–	–	–
0720	72	68.81		1.90		67.4	−0.00	4.85		1.70		78.6	5	0.6	83600	6207	6306	6404
0750	75	71.83		1.90		70.4		4.85		1.70		81.6	5	0.6	87100	–	–	–
0800	80	76.81		1.90	+0.30	75.4		4.85		1.70		86.6	5	0.6	93000	6208	6307	6405
0850	85	81.81		1.90	−0.00	80.4		4.85		1.70		91.6	5	0.6	98700	6209	–	–
0900	90	86.79		2.70		85.4		4.85	+0.00	2.46	+0.00	96.5	5	0.7	151000	6210	6308	6406
0950	95	91.82		2.70		90.4		4.85	−0.15	2.46	−0.10	101.6	5	0.7	160000	–	–	–
1000	100	96.80		2.70		95.2		4.85		2.46		106.5	5	0.7	168000	6211	6309	6407
1100	110	106.81		2.70		105.2		4.85		2.46		116.6	5	0.7	150000	6212	6310	6408
1150	115	111.81	+0.00	2.70		110.2	+1.00	4.85		2.46		121.6	5	0.7	193000	–	–	–
1200	120	115.21	−0.50	3.10		113.6	−0.00	7.21		2.82		129.7	7	0.7	231000	6213	6311	6409
1250	125	120.22		3.10		118.6		7.21		2.82		134.7	7	0.7	241000	6214	–	–
1300	130	125.22		3.10		123.6		7.21		2.82		139.7	7	0.7	250000	6215	6312	6410
1400	140	135.23		3.10		133.0		7.21		2.82		149.7	7	0.7	270000	6216	6313	6411
1450	145	140.23		3.10		138.0		7.21		2.82		154.7	7	0.7	279000	–	–	–
1500	150	145.24		3.10		142.9	+1.60	7.21		2.82		159.7	7	0.7	289000	6217	6314	6412
1600	160	155.22		3.10		152.9	−0.00	7.21		2.82		169.7	7	0.7	308000	6218	6315	6413
1700	170	163.65		3.50		161.3		9.60		3.10		182.9	10	0.7	360000	6219	6316	–
1800	180	173.66		3.50		171.2		9.60		3.10		192.9	10	0.7	381000	6220	6317	6414
1900	190	183.64		3.50		181.0		9.60		3.10		202.9	10	0.7	402000	6221	6318	6415
2000	200	193.65		3.50		191.0		9.60		3.10		212.9	10	0.7	424000	6222	6319	6416
2100	210	203.60		3.50		200.9		9.60		3.10		222.8	10	1.2	445000	–	–	6417
2150	215	208.60		3.50		205.9	+1.80	9.60		3.10		227.8	10	1.2	455000	6224	6320	–
2250	225	217.00		4.50		214.3	−0.00	10.00		3.50		237.0	10	1.2	538000	–	6321	6418
2300	230	222.00		4.50	+0.40	219.2		10.00		3.50		242.0	10	1.2	560000	6226	–	–
2400	240	232.00		4.50	−0.00	229.2		10.00		3.50		252.0	10	1.2	574000	–	6322	–

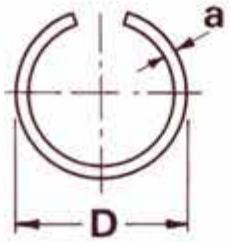
Standard material - carbon spring steel. Standard finish - phosphate and oil.

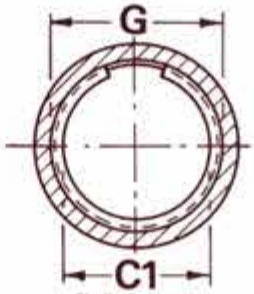
PLAIN INTERNAL RINGS FOR BEARING RETENTION
M2300

All dimensions in mm

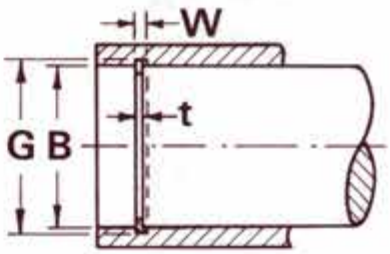


Alternative gap sizes above 21





Circlip in groove



† Thrust load calculations see pages 9 & 10

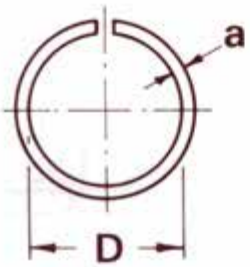
SIZE CODE	Bore (B)	Groove (G)				Circlip (F)						Tc†	Tg†	SIZE CODE
	B	G	Tol.	W	Tol.	D (min)	a	Tol.	t	Tol.	C1	(N)	(N)	
0110	11	11.40		1.1		11.6	1.30		1.0		8.80	8380	830	0110
0120	12	12.40		1.1		12.7	1.30		1.0		9.80	9140	900	0120
0130	13	13.50	+0.11	1.1		13.8	1.30		1.0		10.90	9900	1220	0130
0140	14	14.50	−0.00	1.1		14.8	1.30		1.0		11.90	10600	1320	0140
0150	15	15.50		1.1		15.8	1.30		1.0		12.90	11400	1410	0150
0180	18	18.50		1.3	+0.075	18.9	1.75		1.2		15.00	16400	1700	0180
0190	19	19.60		1.3	−0.000	19.9	1.75		1.2		16.10	17300	2150	0190
0200	20	20.60		1.3		21.0	1.75		1.2		17.10	18300	2260	0200
0220	22	22.60	+0.13	1.3		23.0	1.75		1.2		19.10	20100	2490	0220
0240	24	24.80	−0.00	1.3		25.2	1.75		1.2		21.30	21900	3620	0240
0250	25	25.80		1.3		26.2	1.75		1.2		22.30	22800	3770	0250
0260	26	26.80		1.3		27.2	1.75		1.2		23.30	23700	3920	0260
0280	28	28.80		1.3		29.2	1.75		1.2		25.30	25600	4220	0280
0300	30	31.00		1.6		31.4	2.30		1.5		26.40	34300	5650	0300
0320	32	33.00		1.6		33.4	2.30		1.5		28.40	36600	6030	0320
0340	34	35.00		1.6		35.4	2.30		1.5		30.40	38900	6410	0340
0350	35	36.00		1.6		36.4	2.30		1.5		31.40	40000	6600	0350
0380	38	39.20	+0.16	1.6		39.8	2.30		1.5		34.60	43400	8600	0380
0400	40	41.20	−0.00	1.6		41.8	2.30		1.5		36.60	45700	9050	0400
0420	42	43.20		1.6		43.8	2.30		1.5		38.60	48000	9500	0420
0440	44	45.20		1.6		45.8	2.30		1.5		40.60	50300	9950	0440
0450	45	46.20		1.6		46.8	2.30		1.5		41.60	51400	10200	0450
0470	47	48.20		1.6	+0.10	48.8	2.30		1.5		43.60	53700	10600	0470
0480	48	49.20		1.6	−0.00	49.8	2.30		1.5		44.60	54800	10800	0480
0500	50	51.20		1.6		51.8	2.30		1.5		46.60	57100	11300	0500
0520	52	53.50		1.6		54.3	2.30		1.5		48.90	59400	14700	0520
0550	55	56.50		1.6		57.3	2.30		1.5		51.90	62800	15500	0550
0600	60	61.50		1.6		62.3	2.30		1.5		56.90	68800	17000	0600
0620	62	63.50	+0.19	1.6		64.3	2.30		1.5		58.90	70800	17500	0620
0650	65	66.50	−0.00	1.6		67.3	2.30		1.5		61.90	74300	18400	0650
0680	68	69.50		1.6		70.3	2.30		1.5		64.90	77700	19200	0680
0700	70	71.50		1.6		72.3	2.30		1.5		66.90	80000	19800	0700
0720	72	73.80		2.2		74.6	2.80	+0.00	2.0	+0.00	68.20	105200	24400	0720
0760	76	77.80		2.2		78.6	2.80	−0.10	2.0	−0.10	72.20	111000	25800	0760
0800	80	81.80		2.2		82.6	2.80		2.0		76.20	117000	27100	0800
0820	82	83.80		2.2		84.6	2.80		2.0		78.20	120000	27800	0820
0850	85	86.80		2.2		87.6	2.80		2.0		81.20	124000	28800	0850
0880	88	90.00		2.7		91.0	3.40		2.5		83.20	143000	33200	0880
0900	90	92.00		2.7		93.0	3.40		2.5		85.20	147000	33900	0900
0920	92	94.00		2.7		95.0	3.40		2.5		87.20	150000	34700	0920
0950	95	97.00		2.7		98.0	3.40		2.5		90.20	155000	35800	0950
0970	97	99.00	+0.22	2.7		100.0	3.40		2.5		92.20	158000	36600	0970
0980	98	100.00	−0.00	2.7		101.0	3.40		2.5		93.20	160000	36900	0980
1000	100	102.00		2.7		103.0	3.40		2.5		95.20	163000	37700	1000
1050	105	107.30		2.7		108.3	3.40		2.5		100.50	171000	45500	1050
1070	107	109.30		2.7		110.3	3.40		2.5		102.50	174000	46400	1070
1100	110	112.30		2.7		113.3	3.40		2.5		105.50	179000	47700	1100
1120	112	114.30		2.7		115.3	3.40		2.5		107.50	183000	48600	1120
1150	115	117.30		2.7	+0.13	118.3	3.40		2.5		110.50	187000	49900	1150
1200	120	122.30		2.7	−0.00	123.3	3.40		2.5		115.50	196000	52000	1200
1250	125	127.30		2.7		128.3	3.40		2.5		120.50	204000	54200	1250
1270	127	129.30		2.7		130.3	3.40		2.5		122.50	207000	55100	1270
1300	130	132.30		2.7		133.3	3.40		2.5		125.50	212000	56400	1300
1350	135	137.30		2.7		138.3	3.40		2.5		130.50	220000	58500	1350
1400	140	142.60		2.7		143.6	4.00		2.5		134.60	228000	68600	1400
1430	143	145.60	+0.25	2.7		146.6	4.00		2.5		137.60	233000	70100	1430
1500	150	152.60	−0.00	2.7		153.6	4.00		2.5		144.60	244000	73500	1500
1530	153	155.60		2.7		156.6	4.00		2.5		147.60	249000	75000	1530
1600	160	162.60		2.7		163.6	4.00		2.5		154.60	261000	78400	1600
1650	165	167.60		2.7		168.6	4.00		2.5		159.60	269000	80900	1650
1700	170	172.60		2.7		173.6	4.00		2.5		164.60	277000	83300	1700
1750	175	177.60		2.7		178.6	4.00		2.5		169.60	285000	85800	1750
1800	180	182.60		2.7		183.6	4.00		2.5		174.60	293000	88200	1800
1900	190	193.00	+0.29	3.2		194.5	5.00		3.0		183.00	372000	107000	1900
1950	195	198.00	−0.00	3.2		199.5	5.00		3.0		188.00	381000	110000	1950
2000	200	203.00		3.2		204.5	5.00		3.0		193.00	391000	113000	2000

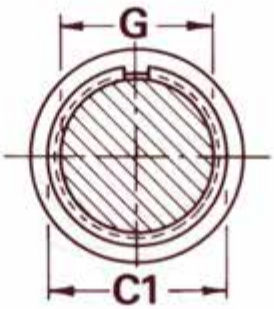
Standard material - carbon spring steel. Standard finish - phosphate and oil.

PLAIN EXTERNAL RINGS FOR BEARING RETENTION
M2400

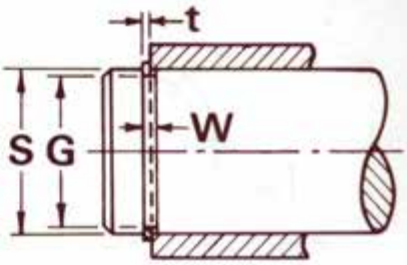
All dimensions in mm

Some sizes below 40





Circlip in groove



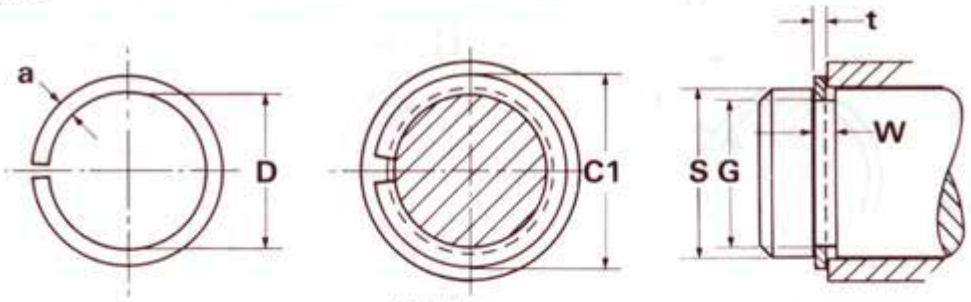
† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft (S)	Groove (G)				Circlip (F)						Tc †	Tg †	SIZE CODE
	S	G	Tol.	W	Tol.	D (max)	a	Tol.	t	Tol.	C1	(N)	(N)	
0100	10	9.60	+0.00 −0.09	1.1	+0.075 −0.000	9.4	1.30	+0.00 −0.10	1.0	+0.00 −0.10	12.20	6860	754	0100
0110	11	10.50		1.1		10.2	1.30		1.0		13.10	7540	1040	0110
0120	12	11.50	+0.00 −0.11	1.1		11.2	1.30		1.0		14.10	8230	1130	0120
0150	15	14.40		1.3		14.0	1.75		1.2		17.90	12600	1700	0150
0170	17	16.40		1.3		16.0	1.75		1.2		19.90	14200	1920	0170
0180	18	17.40		1.3		17.0	1.75		1.2		20.90	15100	2030	0180
0190	19	18.40		1.3		17.9	1.75		1.2		21.90	15900	2150	0190
0200	20	19.20		1.3		18.7	1.75		1.2		22.70	16800	3020	0200
0210	21	20.20		1.3		19.7	1.75		1.2		23.70	17600	3170	0210
0250	25	24.00	+0.00 −0.13	1.3		23.5	1.75		1.2		27.50	21000	4710	0250
0260	26	25.00		1.3		24.5	1.75		1.2		28.50	21800	4900	0260
0270	27	26.00		1.6		25.5	2.30		1.5		30.60	28800	5090	0270
0280	28	27.00		1.6		26.5	2.30		1.5		31.60	29900	5280	0280
0300	30	29.00		1.6		28.5	2.30		1.5		33.60	32000	5650	0300
0320	32	30.80		1.6		30.2	2.30		1.5		35.40	34100	7240	0320
0350	35	33.80	+0.00 −0.16	1.6	+0.10 −0.00	33.2	2.30		1.5		38.40	37300	7920	0350
0400	40	38.50		1.6		37.8	2.30		1.5		43.10	42600	11300	0400
0450	45	43.50		1.6		42.8	2.30		1.5		48.10	48000	12700	0450
0480	48	46.50		1.6		45.8	2.30		1.5		51.10	51200	13600	0480
0500	50	48.50		1.6		47.8	2.30		1.5		53.10	53300	14100	0500
0550	55	53.50		1.6		52.6	2.30		1.5		58.10	58700	15500	0550
0600	60	58.50		1.6		57.6	2.30		1.5		63.10	64000	17000	0600
0650	65	63.50	+0.00 −0.19	1.6		62.6	2.30		1.5		68.10	69300	18400	0650
0700	70	68.20		2.2	+0.13 −0.00	67.4	2.80		2.0		73.80	97100	23800	0700
0750	75	73.20		2.2		72.4	2.80		2.0		78.80	104000	25400	0750
0800	80	78.20		2.2		77.4	2.80		2.0		83.80	111000	27100	0800
0850	85	83.00		2.7		82.0	3.40		2.5		89.80	133000	32000	0850
0900	90	88.00		2.7		87.0	3.40		2.5		94.80	141000	33900	0900
0950	95	93.00		2.7		92.0	3.40		2.5		99.80	149000	35800	0950
1000	100	98.00	+0.00 −0.22	2.7		97.0	3.40		2.5		104.80	156000	37700	1000
1050	105	102.70		2.7		101.7	3.40		2.5		109.50	164000	45500	1050
1100	110	107.70		2.7		106.7	3.40		2.5		114.50	172000	47700	1100
1150	115	112.70		2.7		111.7	3.40		2.5		119.50	180000	49900	1150
1200	120	117.70		2.7		116.7	3.40		2.5		124.50	188000	52000	1200
1250	125	122.70		2.7		121.7	3.40		2.5		129.50	196000	54200	1250
1300	130	127.70		2.7	+0.15 −0.00	126.7	3.40		2.5		134.50	203000	56400	1300
1350	135	132.40		2.7		131.6	4.00		2.5		140.40	211000	66200	1350
1400	140	137.40		2.7		136.6	4.00		2.5		145.40	219000	68600	1400
1450	145	142.40		2.7		141.6	4.00		2.5		150.40	227000	71100	1450
1500	150	147.40	+0.00 −0.25	2.7		146.6	4.00		2.5		155.40	235000	73500	1500
1550	155	152.40		2.7		151.6	4.00		2.5		160.40	242000	76000	1550
1600	160	157.40		2.7		156.6	4.00		2.5		165.40	250000	78400	1600
1650	165	162.40		2.7		161.6	4.00		2.5		170.40	258000	80900	1650
1700	170	167.40		2.7		166.6	4.00		2.5		175.40	266000	83300	1700
1750	175	172.40		2.7		171.6	4.00		2.5		180.40	274000	85000	1750
1800	180	177.00		3.2		175.6	5.00		3.0		187.00	340000	101000	1800
1850	185	182.00		3.2		180.6	5.00		3.0		192.00	350000	105000	1850
1900	190	187.00	+0.00 −0.29	3.2		185.6	5.00		3.0		197.00	359000	107000	1900
1950	195	192.00		3.2		190.6	5.00		3.0		202.00	369000	110000	1950
2000	200	197.00		3.2		195.6	5.00		3.0		207.00	378000	113000	2000

Standard material - carbon spring steel. Standard finish - phosphate and oil.

PLAIN WIRE RINGS
A0500

All dimensions in inches



Circlip in groove

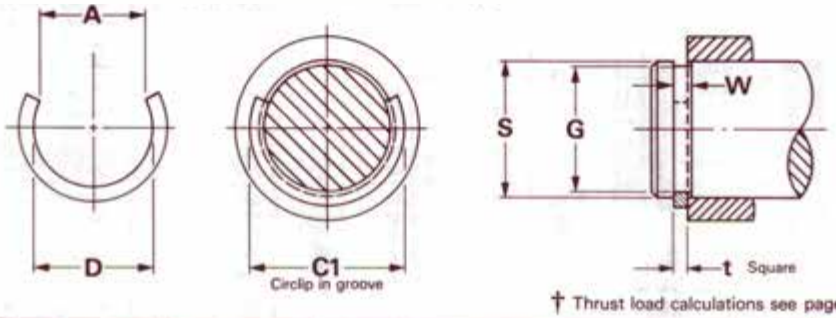
† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft (S)		Groove (G)		Circlip (F)				Tc †	Tg †	SIZE CODE
	S (frac)	S (dec)	G (min)	W (min)	D (max)	a x t	Tol.	C1	(lb.f)	(lb.f)	
0025	1/4	.250	.232	.028	.230	.035 x .025		.312	610	130	0025
0028	9/32	.281	.263	.028	.261	.035 x .025		.343	680	145	0028
0031	5/16	.312	.292	.028	.290	.040 x .025		.382	760	175	0031
0034	11/32	.344	.324	.028	.322	.040 x .025		.414	840	195	0034
0037	3/8	.375	.353	.028	.351	.040 x .025		.443	910	230	0037
0040	13/32	.406	.384	.028	.382	.045 x .025		.484	990	250	0040
0043	7/16	.438	.414	.028	.412	.045 x .025		.514	1070	300	0043
0050	1/2	.500	.476	.039	.474	.048 x .035		.582	1750	340	0050
0056	9/16	.562	.536	.039	.534	.048 x .035	± .002	.642	1960	410	0056
0059	19/32	.594	.567	.039	.565	.060 x .035		.701	2080	450	0059
0062	5/8	.625	.598	.039	.596	.060 x .035		.732	2180	475	0062
0068	11/16	.688	.658	.046	.656	.070 x .042		.812	2920	585	0068
0075	3/4	.750	.717	.046	.715	.070 x .042		.871	3180	700	0075
0081	13/16	.812	.778	.046	.776	.070 x .042		.932	3440	780	0081
0087	7/8	.875	.835	.046	.833	.070 x .042		.989	3710	990	0087
0093	15/16	.938	.898	.046	.896	.081 x .042		1.074	3980	1060	0093
0100	1.	1.000	.957	.046	.955	.081 x .042		1.133	4240	1215	0100

Standard material - carbon spring steel. Standard finish - self finish and oil

PLAIN WIRE RINGS
A0600

All dimensions in inches



Circlip in groove

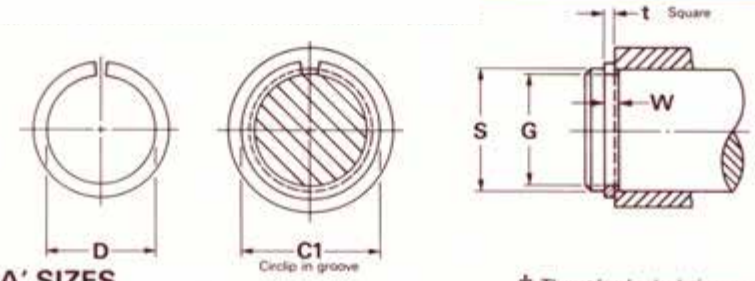
† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft (S)		Groove (G)		Circlip (F)					Tc †	Tg †	SIZE CODE
	S (frac)	S (dec)	G (min)	W (min)	D (max)	t	Tol.	C1	A (max)	(lb.f)	(lb.f)	
0012	1/8	.125	.115	.024	.114	.020		.165	.101	180	27	0012
0015	5/32	.156	.146	.024	.145	.020		.196	.128	220	33	0015
0018	3/16	.187	.178	.024	.175	.020		.228	.154	270	36	0018
0025	1/4	.250	.238	.029	.236	.025		.298	.208	460	64	0025
0031	5/16	.312	.296	.036	.293	.032		.370	.258	740	105	0031
0037	3/8	.375	.357	.041	.353	.036		.439	.311	1015	145	0037
0043	7/16	.438	.418	.045	.413	.040		.508	.346	1320	185	0043
0050	1/2	.500	.476	.052	.471	.046		.578	.414	1750	255	0050
0056	9/16	.563	.530	.069	.525	.062	± .002	.668	.463	2685	395	0056
0062	5/8	.625	.597	.062	.591	.056		.723	.521	2685	370	0062
0068	11/16	.687	.660	.062	.653	.056		.786	.576	2950	395	0068
0075	3/4	.750	.718	.069	.712	.062		.856	.628	3580	510	0075
0081	13/16	.812	.780	.069	.773	.062		.918	.682	3870	550	0081
0093	15/16	.937	.912	.078	.893	.072		1.070	.787	5210	495	0093
0100	1	1.000	.960	.085	.950	.078		1.130	.838	6040	850	0100
0112	1.1/8	1.125	1.079	.100	1.068	.093	± .003	1.279	.940	7260	1100	0112

Standard material - carbon spring steel. Standard finish - self finish and oil

PLAIN WIRE RINGS
A0700 ('A' Sizes) & A0700

All dimensions in inches



A0700 'A' SIZES

† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft (S) S (frac)	Shaft (S) S (dec)	Groove (G) G (min)	Groove (G) W (min)	Circlip (F) D (max)	Circlip (F) t	Circlip (F) Tol.	Circlip (F) C1	Tc† (lb.f)	Tg† (lb.f)	SIZE CODE
A018	3/16	.187	.176	.029	.173	.025	± .002	.236	456	58	A018
A025	1/4	.250	.234	.036	.232	.032		.308	795	113	A025
A037	3/8	.375	.351	.052	.347	.046		.453	1750	255	A037
A043	7/16	.438	.420	.062	.405	.056		.542	2510	225	A043
A050	1/2	.500	.468	.069	.463	.062		.602	3180	450	A050
A056	9/16	.563	.526	.078	.521	.072		.684	4180	590	A056
A062	5/8	.625	.585	.085	.579	.080	± .003	.761	5100	710	A062
A068	11/16	.687	.648	.085	.641	.080		.824	5610	760	A068
A075	3/4	.750	.704	.100	.697	.092		.904	6290	975	A075
A100	1	1.000	.938	.133	.929	.125		1.204	11500	1750	A100
A106	1 .1/16	1.062	1.001	.133	.990	.125		1.267	12200	1830	A106

Standard material - carbon spring steel. Standard finish - self finish & oil.

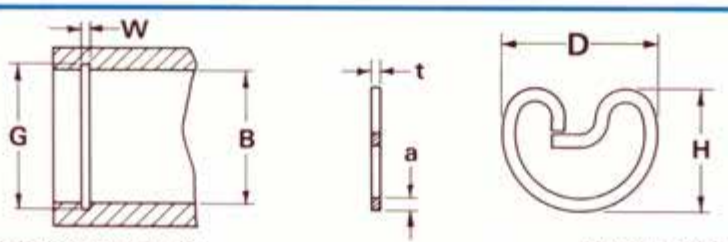
A0700

SIZE CODE	Shaft (S) S (frac)	Shaft (S) S (dec)	Groove (G) G (min)	Groove (G) W (min)	Circlip (F) D (max)	Circlip (F) t	Circlip (F) Tol.	Circlip (F) C1	Tc† (lb.f)	Tg† (lb.f)	SIZE CODE
0012	1/8	.125	.115	.024	.114	.020	± .002	.165	238	35	0012
0015	5/32	.156	.146	.024	.145	.020		.196	300	44	0015
0018	3/16	.187	.178	.024	.175	.020		.228	357	48	0018
0021	7/32	.219	.207	.029	.203	.025		.267	530	75	0021
0025	1/4	.250	.238	.029	.236	.025		.298	610	85	0025
0028	9/32	.281	.265	.036	.261	.032		.339	894	127	0028
0031	5/16	.312	.296	.036	.293	.032		.370	992	140	0031
0037	3/8	.375	.357	.041	.353	.036		.439	1350	190	0037
0043	7/16	.438	.418	.045	.413	.040		.508	1765	250	0043
0050	1/2	.500	.476	.052	.471	.046		.578	2333	340	0050
0056	9/16	.563	.530	.069	.525	.062		.668	3580	525	0056
0062	5/8	.625	.597	.062	.591	.056		.723	3580	495	0062
0068	11/16	.687	.660	.062	.653	.056		.786	3930	525	0068
0075	3/4	.750	.718	.069	.712	.062		.856	4770	680	0075
0081	13/16	.812	.780	.069	.773	.062		.918	5165	735	0081
0087	7/8	.875	.839	.078	.831	.072		.997	6500	890	0087
0100	1	1.000	.960	.085	.950	.078	± .003	1.132	7950	1130	0100
0106	1.11/16	*.062	1.023	.085	1.012	.078		1.195	8450	1170	0106
0112	1.1/8	1.125	1.079	.100	1.068	.093		1.281	9540	1460	0112

Standard material - carbon spring steel. Standard finish - self finish & oil.

PLAIN WIRE RINGS
M2500

All dimensions in mm



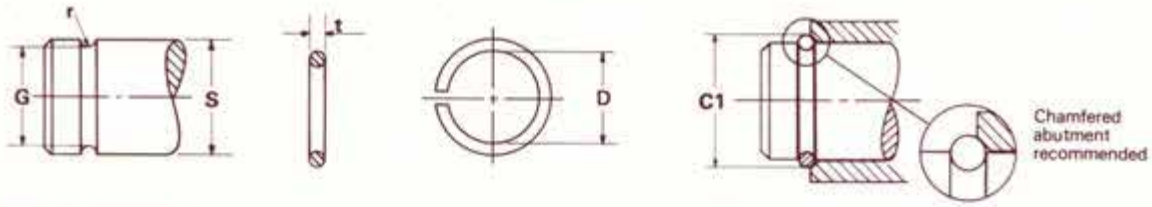
† Thrust load calculations see pages 9 & 10

Thickness variants available on request.

SIZE CODE	Bore B	Groove (G) G	Groove (G) Tol.	Groove (G) W	Groove (G) Tol.	Circlip (F) t	Circlip (F) Tol.	Circlip (F) a	Circlip (F) Tol.	D	H	Tc† (N)	Tg† (N)	SIZE CODE
0240	24	25.2	+0.08 −0.00	1.6	+0.140 −0.000	1.5	+0.000 −0.030	2.0	+0.060 −0.100	26.3	21.5	29000	7000	0240
0270	27	28.2		1.6		1.5		2.4		30.1	24.4	33000	8000	0270
0300	30	31.2		1.6		1.5		2.4		32.7	27.0	37000	8800	0300

Standard material - carbon spring steel. Standard finish - self finish and oil

All dimensions in inches



A0900 'A' SIZES

† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft (S) S (frac)	S (dec)	Groove (G) G	Tol	r	Tol	Circlip (F) D (max)	t	Tol.	C1	Tc† (lb.f)	Tg† (lb.f)	SIZE CODE
A025	1/4	.250	.232	+.003 −.000	.0187	+.001 −.000	.230	.036	±.002	.317	300	106	A025
A037	3/8	.375	.349		.024		.345	.043		.448	545	244	A037
A050	1/2	.500	.464		.031	+.002 −.000	.458	.059		.596	1010	450	A050
A062	5/8	.625	.581		.039		.575	.072		.743	1550	710	A062
A068	11/16	.688	.644	+.004 −.000	.039		.637	.072		.806	1700	780	A068
A075	3/4	.750	.698		.044	+.003 −.000	.690	.085	±.003	.888	1930	1020	A075
A100	1	1.000	.926		.0605		.917	.118		1.182	3610	1980	A100

Standard material - carbon spring steel. Standard finish - self finish & oil.

A0900

SIZE CODE	Shaft (S) S (frac)	S (dec)	Groove (G) G	Tol	r	Tol	Circlip (F) D (max)	t	Tol.	C1	Tc† (lb.f)	Tg† (lb.f)	SIZE CODE
0012	1/8	.125	.111		.013		.110	.022		.165	88	39	0012
0015	5/32	.156	.142		.013		.140	.022		.196	110	48	0015
0018	3/16	.187	.174	+.003 −.000	.013	+.001 −.000	.172	.022		.228	132	53	0018
0021	7/32	.219	.205		.013		.202	.022		.259	155	68	0021
0025	1/4	.250	.232		.016		.230	.028		.298	230	106	0025
0037	3/8	.375	.357		.016		.353	.028		.426	345	159	0037
0043	7/16	.438	.416		.020		.412	.035	±.002	.496	510	235	0043
0050	1/2	.500	.474		.024		.468	.043		.570	725	325	0050
0056	9/16	.562	.534		.026		.529	.045		.634	855	400	0056
0062	5/8	.625	.593	+.004 −.000	.028	+.002 −.000	.587	.051		.709	1080	495	0062
0068	11/16	.688	.656		.028		.649	.051		.772	1190	565	0068
0075	3/4	.750	.714		.031		.706	.059		.850	1510	680	0075
0087	7/8	.875	.831		.039		.823	.072		.993	2160	990	0087
0093	15/16	.938	.894		.039		.885	.072		1.052	2320	1080	0093
•0106	1. 1/16	1.062	1.011		.044		1.000	.085		1.202	2740	1380	0106
0118	1. 3/16	1.188	1.126	+.005 −.000	.052	+.003 −.000	1.114	.100	±.003	1.347	3620	1915	0118
0137	1. 3/8	1.375	1.295		.069		1.281	.130		1.571	5500	2990	0137

Standard material - carbon spring steel. Standard finish - self finish & oil.

A1000

SIZE CODE	Shaft (S) S (frac)	S (dec)	Groove (G) G	Tol	r	Tol	Circlip (F) D (max)	t	Tol.	C1	Tc† (lb.f)	Tg† (lb.f)	SIZE CODE
0012	1/8	.125	.113		.0065		.110	.012		.147	44	32	0012
0025	1/4	.250	.228		.0115		.221	.022		.285	177	134	0025
0031	5/16	.312	.290		.0115		.281	.022		.347	220	168	0031
0034	11/32	.344	.322		.0115		.312	.022		.379	243	185	0034
0037	3/8	.375	.339	+.003 −.000	.0187	+.001 −.000	.329	.036		.424	450	350	0037
0040	13/32	.406	.370		.0187		.359	.036		.455	490	380	0040
0043	7/16	.438	.402		.0187		.390	.036		.487	525	410	0043
0046	15/32	.469	.433		.0187		.420	.036	±.002	.518	565	440	0046
0050	1/2	.500	.452		.0250		.438	.048		.562	815	620	0050
0056	9/16	.562	.514		.0250		.498	.048		.624	915	700	0056
0062	5/8	.625	.577		.0250		.560	.048		.687	1010	775	0062
0068	11/16	.688	.640		.0250		.621	.048		.750	1120	855	0068
0075	3/4	.750	.686	+.004 −.000	.0335	+.002 −.000	.665	.064		.832	1640	1270	0075
0081	13/16	.812	.748		.0335		.726	.064		.894	1780	1380	0081
0087	7/8	.875	.811		.0335		.786	.064		.957	1920	1480	0087
0093	15/16	.938	.874		.0335		.848	.064		1.020	2050	1590	0093
0100	1	1.000	.936		.0335		.908	.064		1.082	2190	1690	0100
0106	1. 1/16	1.062	.982		.0415		.953	.080		1.163	2890	2250	0106
0112	1. 1/8	1.125	1.045		.0415		1.012	.080		1.226	3060	2380	0112
0125	1. 1/4	1.250	1.170		.0415		1.135	.080		1.351	3400	2650	0125
0137	1. 3/8	1.375	1.295		.0415		1.258	.080		1.476	3740	2910	0137
0150	1. 1/2	1.500	1.420	+.005 −.000	.0415		1.380	.080		1.601	4080	3180	0150
0162	1. 5/8	1.625	1.545		.0415		1.500	.080		1.726	4420	3440	0162
0175	1. 3/4	1.750	1.670		.0415		1.621	.080		1.851	4760	3710	0175
0187	1. 7/8	1.875	1.771		.0545	+.003 −.000	1.720	.104	±.003	2.000	5950	5250	0187
0200	2	2.000	1.896		.0545		1.840	.104		2.125	6340	5600	0200
0212	2. 1/8	2.125	2.021		.0545		1.960	.104		2.252	6740	5830	0212
0237	2. 3/8	2.375	2.271		.0545		2.203	.104		2.502	7540	6510	0237
0250	2. 1/2	2.500	2.396	+.007 −.000	.0545		2.324	.104		2.627	7930	6850	0250
0262	2. 5/8	2.625	2.497		.0665		2.425	.128		2.776	10300	8980	0262
0300	3	3.000	2.872		.0665		2.785	.128		3.151	11800	10300	0300

Standard material - carbon spring steel. Standard finish - zinc coated.

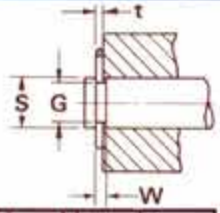
PLAIN WIRE RINGS
A1100, A1200 & M1700

All dimensions in inches

Standard material - carbon spring steel. Standard finish - self finish and oil.

FORM 1 FORM 2 FORM 3

Ring in groove



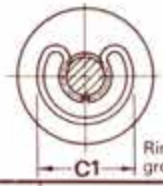
A1100

† Thrust load calculations see pages 9 & 10

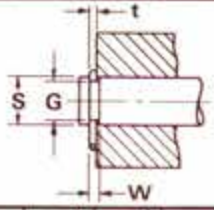
SIZE CODE	Shaft (S) S	Shaft (S) Tol.	Groove (G) G	Groove (G) Tol.	Groove (G) W	Groove (G) Tol.	Circlip (F) H	Circlip (F) C1	Circlip (F) t	Circlip (F) Tol.	Tc† (lb.f)	Tg† (lb.f)	Applicator	FORM
0008	.172	+.000 −.030	.095	±.010	.026	+.003 −.000	.410	.430	.022 dia.	±.002	55	62	32	1
0012	.218		.135		.040		.470	.490	.036 dia.		158	114	34A	3
0015	.234		.160		.040		.450	.570	.036 sq.		201	103	36	1
0018	.250		.170		.040		.500	.520	.036 dia.		158	110	37	3
0021	.297	+.000 −.050	.195	±.015	.044	+.004 −.000	.520	.560	.040 dia.		197	160	31	3
0028	.438		.300	±0.20	.060		.750	.890	.056 dia.		398	307	38	3
0037	.531		.390		.060		.840	.960	.056 dia.		398	312	33	2
0043	.562	+.000 −.070	.440		.060		.850	.960	.056 dia.		398	276	39	2
0050	.656		.500		.068		1.130	1.330	.064 dia.		525	393	53	1

All dimensions in inches

Standard material - carbon spring steel. Standard finish - self finish and oil.



Ring in groove

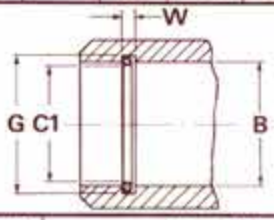


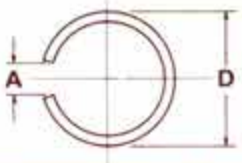
A1200

SIZE CODE	Shaft (S) S	Shaft (S) Tol.	Groove (G) G	Groove (G) Tol.	Groove (G) W	Groove (G) Tol.	Circlip (F) D1	Circlip (F) C1	Circlip (F) t	Circlip (F) Tol.	Tc† (lb.f)	Tg† (lb.f)	Applicator	SIZE CODE
0007	.125	+.005 −.015	.075	+.005 −.000	.036	+.003 −.000	.310	.340	.032 dia.	±.002	338	70	40	0007
0011	.156		.115		.036		.360	.390	.032 sq.		434	63	41	0011
0013	.188		.130		.040		.450	.490	.036 dia.		603	139	42	0013
0014	.188		.140		.036		.400	.440	.032 sq.		532	84	43	0014
0015	.219		.150		.052		.510	.550	.048 sq.		962	190	44	0015
R015	.219		.150	+.010 −.005	.052		.510	.550	.048 dia.		962	190	44	R015
0017	.219		.170		.036		.480	.530	.032 sq.		600	104	45	0017
0019	.250		.195		.044		.480	.540	.040 sq.		915	150	46	0019
0021	.250		.200		.036		.480	.540	.032 sq.		723	125	47	0021
R021	.250		.200		.036		.480	.540	.032 dia.		700	125	47	R021
0022	.266	+.010 −.015	.210		.044		.540	.590	.040 sq.		978	165	48	0022
0023	.281		.220		.052		.560	.610	.048 dia.		1200	203	49	0023
0025	.313		.255		.044		.570	.630	.040 sq.		1160	209	50	0025
0034	.375		.330		.044		.690	.740	.040 sq.		1400	153	51	0034
0043	.500		.435		.060		.870	.940	.056 sq.		2680	411	52	0043
0052	.563	±.015	.500	+.015 −.010	.068	+.004 −.000	1.030	1.100	.064 sq.		3480	383	53A	0052
0057	.625		.560		.068		1.120	1.200	.064 sq.		3880	452	54A	0057

All dimensions in mm

Standard material - carbon spring steel. Standard finish - self finish and oil.





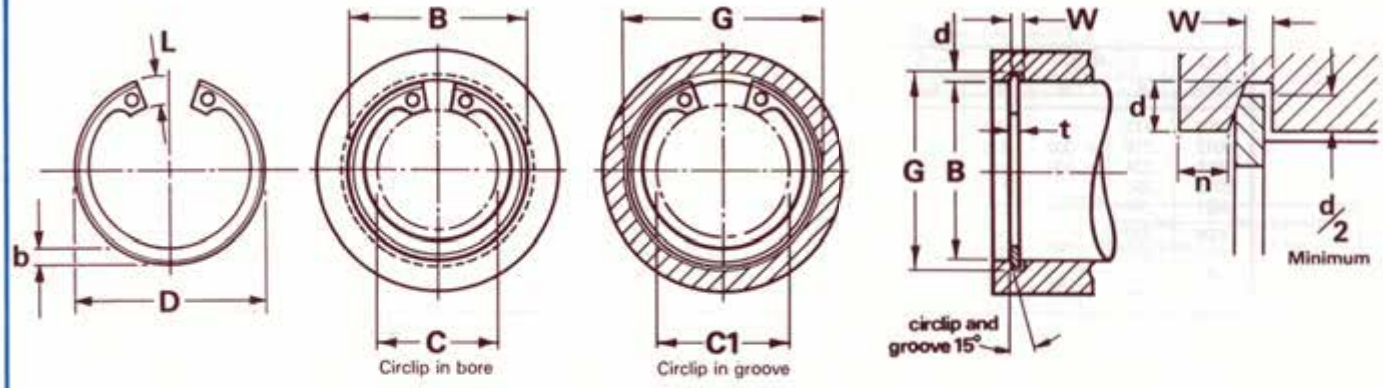
M1700

SIZE CODE	Bore (B) B	Groove (G) G	Groove (G) Tol.	Groove (G) W	Groove (G) Tol.	Circlip (F) D (min)	Circlip (F) t	Circlip (F) Tol.	Circlip (F) C1	Circlip (F) A (min)	Tc† (N)	Tg† (N)	SIZE CODE
0100	10	11.05	+0.15 −0.00	1.0	+0.08 −0.00	11.8	0.9	+0.08 −0.04	8.9	7.0	5020	1580	0100
0120	12	13.13		1.1		13.9	1.0		10.8	7.0	6730	2040	0120
0125	12.5	13.64		1.1		14.4	1.0		11.3	7.0	7010	2150	0125
0130	13	14.15		1.1		14.9	1.0		11.8	7.0	7290	2250	0130
0140	14	15.34		1.3		16.1	1.2		12.6	7.5	9490	2830	0140
0150	15	16.36		1.3		17.1	1.2		13.6	7.5	10200	3070	0150
0160	16	17.35		1.3		18.1	1.2		14.6	7.5	10800	3250	0160
0170	17	18.54		1.5		19.3	1.4		15.3	8.0	13500	3940	0170
0175	17.5	19.05		1.5		20.0	1.4		15.8	9.0	13900	4090	0175
0180	18	19.56		1.5		20.5	1.4		16.3	9.0	14300	4230	0180
0190	19	20.55		1.5		21.5	1.4		17.3	9.0	15100	4440	0190
0200	20	21.54		1.5		22.5	1.4		18.3	9.0	15900	4640	0200
0210	21	22.76		1.7		23.7	1.6		19.1	9.5	19100	5570	0210
0220	22	23.75		1.7		24.7	1.6		20.1	9.5	20000	5800	0220
0240	24	25.96		1.9		27.0	1.8		21.9	10.0	24700	7090	0240
0250	25	26.95		1.9		27.9	1.8		22.9	10.0	25700	7350	0250
0280	28	30.15		2.1		31.1	2.0		25.7	11.0	28500	9080	0280
0300	30	32.15		2.1	+0.10 −0.00	33.1	2.0	+0.10 −0.05	27.7	11.0	30500	9720	0300
0320	32	34.15		2.1		35.1	2.0		29.7	11.0	32500	10400	0320
0340	34	36.17		2.1		37.1	2.0		31.7	11.0	34600	11100	0340

BEVELLED CIRCLIPS
N1302

Equivalent to MIL-R-21248/MS 16631

All dimensions in inches



E = Maximum end play take up capability

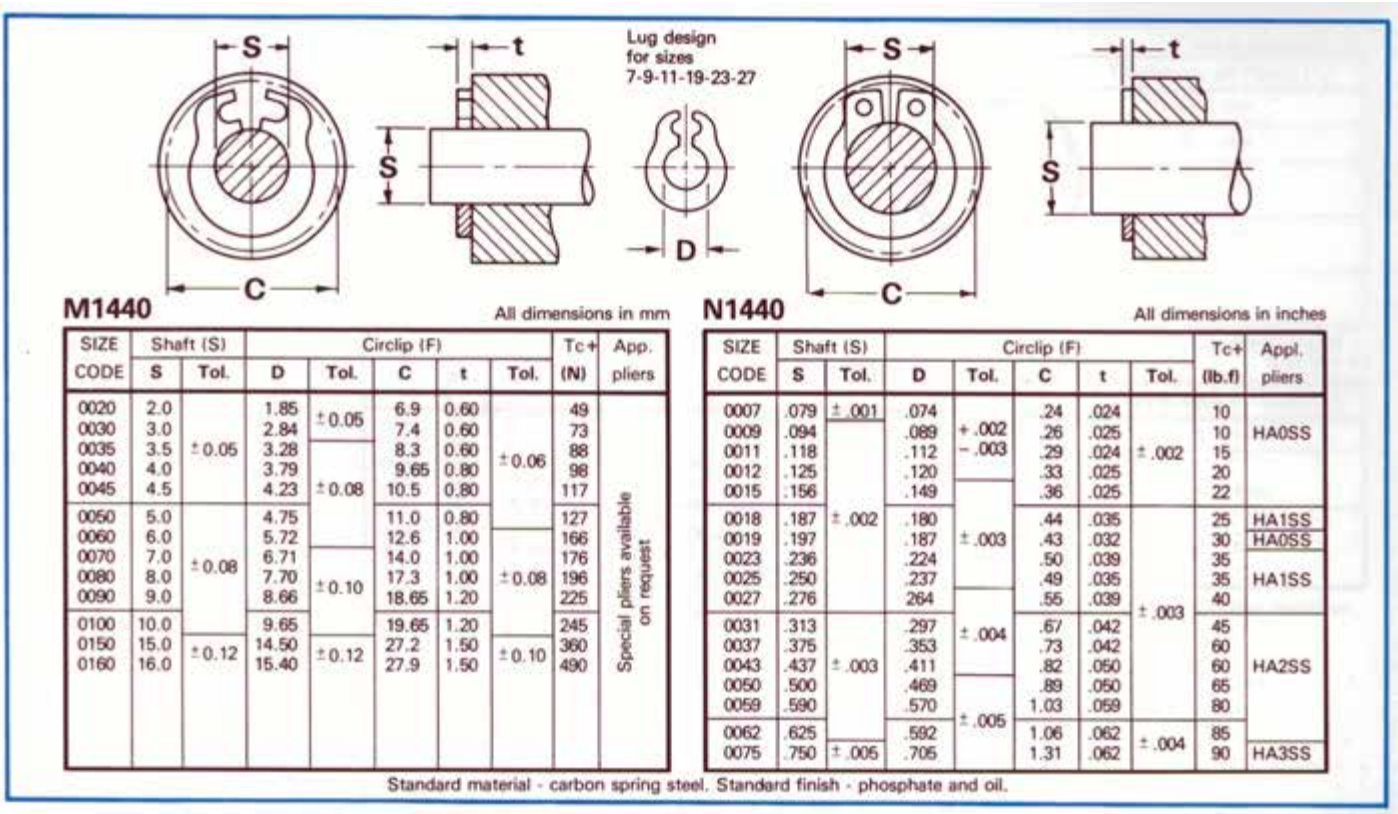
† Thrust load calculations see pages 9 & 10

SIZE CODE	Bore (B)		Groove (G)						Circlip (F)									Tc†	Tg†
	B		G	Tol.	W	Tol.	n	d	t	Tol.	D	Tol.	C	C1	L	b	E	(lb.f)	(lb.f)
	(frac.)	(dec.)					(min)	~							(max)	~			
0156	1.9/16	1.562	1.674		.052		.176	.058	.062		1.734		1.11	1.20	.207	.160	.007	11400	2560
0162	1.5/8	1.625	1.743		.051		.185	.061	.062		1.804		1.12	1.22	.232	.160	.008	11800	2800
0165	—	1.653	1.773		.051		.188	.062	.062		1.835		1.15	1.25	.232	.167	.008	12000	2900
0168	1.11/16	1.688	1.810		.050		.191	.063	.062		1.874		1.18	1.28	.232	.170	.008	12300	3010
0175	1.3/4	1.750	1.878	+.005 −.000	.050	+.001 −.000	.200	.066	.062		1.942	+.035 −.025	1.23	1.33	.239	.175	.008	12700	3260
0181	1.13/16	1.812	1.944		.050		.206	.068	.062		2.012		1.29	1.40	.239	.170	.009	13200	3480
0185	—	1.850	1.984		.050		.209	.069	.062		2.054		1.33	1.44	.239	.170	.009	13500	3610
0187	1.7/8	1.875	2.011		.050		.212	.070	.062		2.072		1.36	1.46	.239	.170	.009	13700	3710
0193	1.15/16	1.938	2.082		.049		.224	.074	.062		2.141		1.42	1.53	.239	.165	.009	14100	4050
0200	2	2.000	2.144		.048		.224	.074	.062		2.210		1.47	1.58	.245	.170	.009	14600	4180
0206	2.1/16	2.062	2.210		.065		.231	.077	.078		2.280		1.51	1.63	.255	.186	.009	18900	4490
0212	2.1/8	2.125	2.279		.065		.240	.080	.078		2.350		1.56	1.67	.265	.195	.010	19500	4800
0218	2.3/16	2.188	2.350		.064		.252	.084	.078		2.415		1.61	1.73	.269	.199	.010	20100	5200
0225	2.1/4	2.250	2.420		.064		.264	.088	.078		2.490		1.66	1.79	.275	.203	.010	20700	5600
0231	2.5/16	2.312	2.484		.063		.267	.089	.078		2.560		1.72	1.85	.275	.205	.011	21200	5820
0237	2.3/8	2.375	2.552		.063		.275	.091	.078		2.630		1.79	1.91	.275	.207	.011	21800	6110
0244	2.7/16	2.440	2.618		.062	+.0015 −.000	.276	.092	.078		2.702		1.83	1.96	.285	.205	.012	22400	6350
0250	2.1/2	2.500	2.684		.062		.285	.095	.078		2.775	+.040 −.030	1.89	2.02	.285	.210	.012	23000	6710
0256	2.9/16	2.562	2.750		.078		.291	.097	.093		2.844		1.93	2.07	.295	.222	.012	28000	7020
0262	2.5/8	2.625	2.820		.077		.302	.100	.093		2.910		2.00	2.13	.295	.226	.013	28700	7420
0268	2.11/16	2.688	2.887		.077		.308	.102	.093		2.980		2.04	2.18	.305	.236	.013	29400	7750
0275	2.3/4	2.750	2.955		.076		.317	.105	.093		3.050		2.10	2.24	.305	.234	.014	30100	8160
0281	2.13/16	2.812	3.020		.076		.321	.107	.093		3.121		2.16	2.31	.305	.230	.014	30800	8510
0287	2.7/8	2.875	3.085		.076		.324	.108	.093	±.003	3.191		2.21	2.35	.315	.240	.014	31500	8780
0300	3	3.000	3.225		.074		.347	.115	.093		3.325		2.33	2.48	.315	.250	.015	32800	9750
0306	3.1/16	3.062	3.290	+.006 −.000	.089		.351	.117	.109		3.418		2.39	2.54	.318	.254	.015	39300	10100
0312	3.1/8	3.125	3.355		.089		.354	.118	.109		3.488		2.45	2.60	.318	.260	.015	40100	10400
0315	3.5/32	3.156	3.388		.089		.357	.119	.109		3.523		2.48	2.64	.318	.260	.015	40500	10600
0325	3.1/4	3.250	3.489		.089		.368	.122	.109		3.623		2.51	2.67	.350	.269	.016	41700	11200
0334	3.11/32	3.346	3.591		.089		.377	.125	.109		3.734	±.055	2.61	2.77	.350	.276	.016	42900	11800
0347	3.15/32	3.469	3.726		.089		.395	.131	.109		3.857		2.73	2.90	.350	.294	.017	44500	12800
0350	3.1/2	3.500	3.760		.089		.399	.133	.109		3.890		2.76	2.93	.350	.294	.017	44900	13200
0354	—	3.543	3.806		.089		.396	.132	.109		3.936		2.83	2.97	.350	.292	.018	45700	13800
0362	3.5/8	3.625	3.900		.089		.422	.140	.109		4.024		2.89	3.06	.350	.298	.018	46500	14300
0375	3.3/4	3.750	4.040		.089	+.002 −.000	.444	.148	.109		4.157		3.01	3.20	.350	.309	.019	48100	15700
0387	3.7/8	3.875	4.171		.089		.453	.151	.109		4.291		3.08	3.27	.378	.312	.020	49700	16500
0393	3.15/16	3.938	4.236		.089		.456	.152	.109		4.358		3.14	3.33	.378	.320	.020	50500	16900
0400	4	4.000	4.302		.089		.462	.154	.109		4.424		3.20	3.40	.378	.330	.020	51300	17400
0412	4.1/8	4.125	4.433		.089		.471	.157	.109		4.558		3.33	3.52	.378	.330	.021	53000	18300
0425	4.1/4	4.250	4.562		.089		.477	.159	.109		4.691		3.45	3.65	.378	.335	.021	54500	19100
0433	—	4.331	4.647		.089		.483	.161	.109		4.756	±.065	3.47	3.66	.413	.345	.021	55600	19700
0450	4.1/2	4.500	4.824		.089		.495	.165	.109		4.940		3.63	3.84	.413	.351	.022	57800	21000
0462	4.5/8	4.625	4.955		.089		.504	.168	.109		5.076		3.76	3.96	.413	.350	.022	59400	22000
0475	4.3/4	4.750	5.086		.089		.513	.171	.109		5.213		3.88	4.09	.413	.370	.023	61000	23000
0500	5	5.000	5.346		.089		.528	.176	.109		5.485		4.07	4.29	.443	.395	.023	64200	24900
0525	5.1/4	5.250	5.612	+.007 −.000	.102	+.003 −.000	.554	.184	.125	±.004	5.770		4.28	4.50	.465	.408	.024	77300	27300
0537	5.3/8	5.375	5.739		.102		.557	.185	.125		5.910		4.41	4.63	.465	.408	.024	79100	28100
0550	5.1/2	5.500	5.864		.102		.557	.185	.125		6.066		4.53	4.75	.465	.408	.024	81000	28800

Standard material - carbon spring steel. Standard finish - phosphate and oil.

NO GROOVE CIRLIPS
M1440 & N1440

Equivalent to MIL-R-21248/MS 90707



M1440

All dimensions in mm

SIZE CODE	Shaft (S) S	Shaft (S) Tol.	Circlip (F) D	Circlip (F) Tol.	Circlip (F) C	Circlip (F) t	Circlip (F) Tol.	Tc+ (N)	App. pliers
0020	2.0		1.85	± 0.05	6.9	0.60		49	
0030	3.0		2.84		7.4	0.60		73	
0035	3.5	± 0.05	3.28		8.3	0.60	± 0.06	88	
0040	4.0		3.79	± 0.08	9.65	0.80		98	
0045	4.5		4.23		10.5	0.80		117	
0050	5.0		4.75		11.0	0.80		127	
0060	6.0		5.72		12.6	1.00		166	
0070	7.0	± 0.08	6.71		14.0	1.00		176	
0080	8.0		7.70	± 0.10	17.3	1.00	± 0.08	196	
0090	9.0		8.66		18.65	1.20		225	
0100	10.0		9.65		19.65	1.20		245	
0150	15.0	± 0.12	14.50	± 0.12	27.2	1.50	± 0.10	360	
0160	16.0		15.40		27.9	1.50		490	

Special pliers available on request

N1440

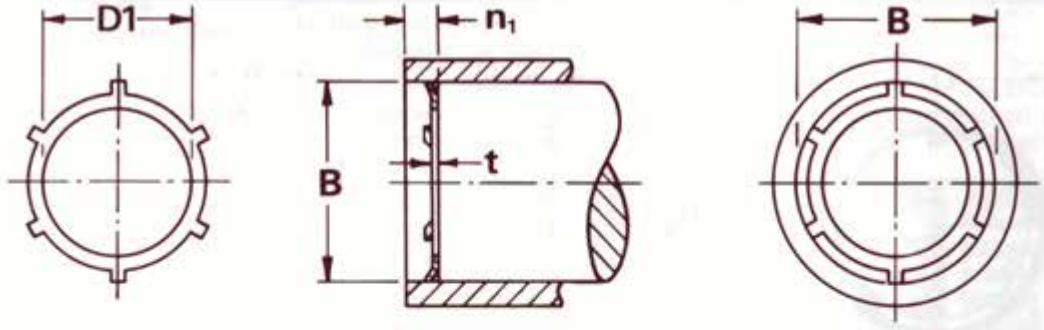
All dimensions in inches

SIZE CODE	Shaft (S) S	Shaft (S) Tol.	Circlip (F) D	Circlip (F) Tol.	Circlip (F) C	Circlip (F) t	Circlip (F) Tol.	Tc+ (lb.f)	Appl. pliers
0007	.079	± .001	.074		.24	.024		10	
0009	.094		.089	+ .002 − .003	.26	.025		10	HA0SS
0011	.118		.112		.29	.024	± .002	15	
0012	.125		.120		.33	.025		20	
0015	.156		.149		.36	.025		22	
0018	.187	± .002	.180		.44	.035		25	HA1SS
0019	.197		.187	± .003	.43	.032		30	HA0SS
0023	.236		.224		.50	.039		35	
0025	.250		.237		.49	.035		35	HA1SS
0027	.276		.264		.55	.039		40	
0031	.313		.297	± .004	.67	.042	± .003	45	
0037	.375		.353		.73	.042		60	
0043	.437	± .003	.411		.82	.050		60	HA2SS
0050	.500		.469		.89	.050		65	
0059	.590		.570	± .005	1.03	.059		80	
0062	.625		.592		1.06	.062		85	
0075	.750	± .005	.705		1.31	.062	± .004	90	HA3SS

Standard material - carbon spring steel. Standard finish - phosphate and oil.

PUSH-ON FASTENERS
N1305

All dimensions in inches



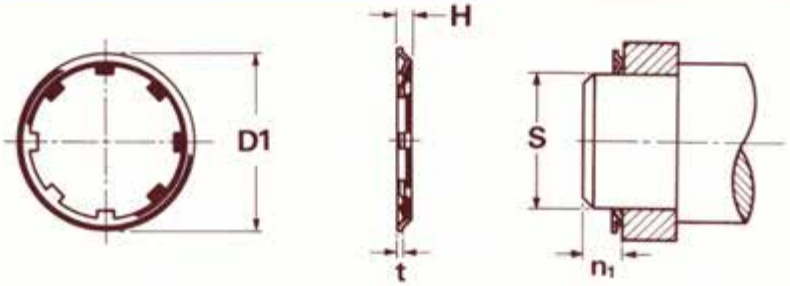
\+ Typical values for mild steel bores.

SIZE CODE	Bore (B) B (min)	B (max)	B (frac.)	Circlip (F) D1	D1 Tol.	t	t Tol.	n_1 (min)	Wt kg/k	Tc + (lb.f)	SIZE CODE
0031	.311	.313	5/16	.136		.010		.040	.05	80	0031
0037	.374	.376	3/8	.175	± .005	.010		.040	.07	75	0037
0043	.437	.439	7/16	.237		.010	± .001	.040	.09	70	0043
0050	.498	.502	1/2	.258		.010		.040	.11	60	0050
0056	.560	.564	9/16	.312		.010		.040	.13	50	0056
0062	.623	.627	5/8	.390		.010		.040	.14	45	0062
0075	.748	.752	3/4	.500		.015		.060	.28	75	0075
0087	.873	.877	7/8	.625	± .010	.015		.060	.34	70	0087
0093	.936	.940	15/16	.687		.015		.060	.39	70	0093
0100	.998	1.002	1	.750		.015		.060	.41	75	0100
0118	1.185	1.189	1.3/16	.875		.015	± .002	.060	.63	70	0118
0125	1.248	1.252	1.1/4	.938		.015		.060	.68	60	0125
*0137	1.371	1.379	1.3/8	1.050	± .015	.015		.125	.95	150	0137
0143	1.435	1.439	1.7/16	1.125		.015		.060	.77	60	0143
0150	1.498	1.502	1.1/2	1.188	± .010	.015		.060	.82	60	0150
0175	1.748	1.752	1.3/4	1.438		.015		.060	.95	55	0175
0200	1.998	2.002	2	1.600		.015		.060	1.36	55	0200

Standard material - carbon spring steel. Standard finish - phosphate and oil

METRIC PUSH-ON FASTENERS
M1465

All dimensions in mm



+ Typical values for mild steel shafts.

SIZE CODE	Shaft (S) S	Shaft (S) Tol	Circlip (F) D1	Circlip (F) H	Circlip (F) t	Circlip (F) No. of tabs	Circlip (F) n_1 (min)	Wt. kg/k	Tc+ (N)	SIZE CODE
0020	2	±0.10	6.5	0.8	0.25	3	1.6	0.05	147	0020
0030	3		9.1	0.8	0.25	4	1.6	0.09	196	0030
0040	4		10.1	0.8	0.25	5	1.6	0.11	196	0040
0050	5	±0.12	11.5	0.8	0.25	6	1.6	0.12	196	0050
0060	6		12.0	1.0	0.40	6	2.0	0.28	196	0060
0080	8		14.8	1.0	0.40	8	2.0	0.32	196	0080
0100	10		17.2	1.2	0.40	8	2.4	0.48	343	0100
0120	12		18.0	1.2	0.40	10	2.4	0.58	343	0120
0140	14	±0.15	20.5	1.4	0.40	10	2.8	0.68	441	0140
0150	15		23.0	1.4	0.40	10	2.8	0.75	588	0150
0160	16		24.5	1.4	0.40	7	2.8	0.78	686	0160
0170	17		26.0	1.4	0.40	7	2.8	0.80	784	0170
0180	18		27.0	1.6	0.40	8	3.2	0.84	784	0180
0200	20		29.0	1.6	0.50	8	3.2	0.88	882	0200
0220	22		31.0	1.6	0.50	12	3.2	0.93	882	0220
0250	25		34.0	1.6	0.50	8	3.2	1.10	980	0250
0280	28		37.0	1.8	0.50	8	3.6	1.20	980	0280
0300	30		40.0	1.8	0.50	8	3.6	1.35	980	0300

Standard material - carbon spring steel. Standard finish - phosphate and oil

PUSH-ON FASTENERS
N1465 (Reinforced)

All dimensions in inches

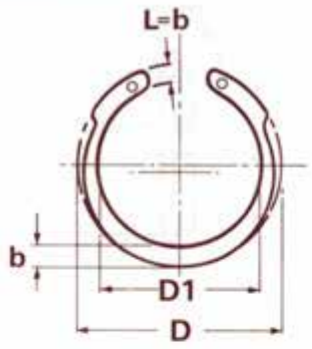
+ Typical values for mild steel shafts.

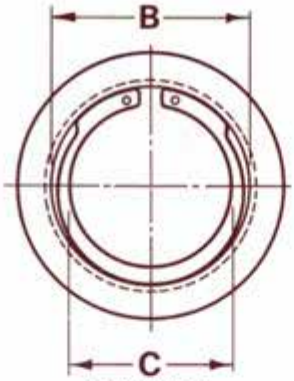
SIZE CODE	Shaft (S) S (min)	S (max)	S (frac.)	Circlip (F) D1	Tol.	H	Tol.	t	Tol.	n_1 (min)	Wt kg/k	Tc + (lb.f)	SIZE CODE
0009	.091	.097	3/32	.326	±.005	.029	±.005	.010	±.001	.058	.07	27	0009
0012	.121	.129	1/8	.366		.029		.010		.058	.09	38	0012
0015	.152	.160	5/32	.397		.043	±.009	.010		.058	.10	45	0015
0018	.184	.192	3/16	.460		.031	±.007	.010		.062	.12	55	0018
0025	.246	.254	1/4	.522		.037		.010		.074	.18	58	0025
0031	.308	.316	5/16	.584		.037	±.008	.010		.074	.20	60	0031
0037	.371	.379	3/8	.645		.037		.010		.074	.22	65	0037
0043	.432	.442	7/16	.766		.045	±.009	.015	±.002	.090	.44	120	0043
0050	.495	.505	1/2	.828	±.010	.054	±.010	.015		.108	.58	120	0050
0056	.557	.567	9/16	.889		.054		.015		.108	.63	125	0056
0062	.620	.630	5/8	.951		.054		.015		.108	.67	135	0062
0075	.745	.755	3/4	1.076		.054		.015		.108	.75	140	0075
0087	.870	.880	7/8	1.203		.054		.015		.108	.89	140	0087
0100	.995	1.005	1	1.327		.054		.015		.108	1.04	140	0100

Standard material - carbon spring steel. Standard finish - phosphate and oil

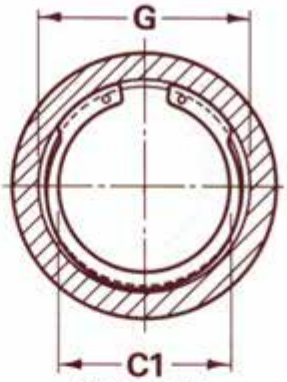
BALANCED LUG CIRCLIPS EUROPEAN SPECIFICATION
M1308

All dimensions in mm

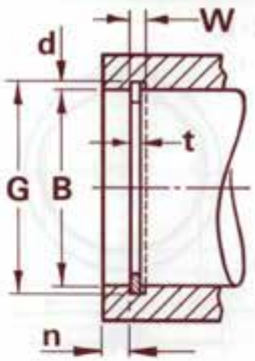




Circlip in bore



Circlip in groove




Beam configuration on some larger sizes

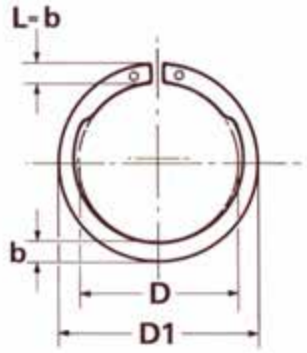
† Thrust load calculations see pages 9 & 10

SIZE CODE	Bore (B)	Groove (G)						Circlip (F)								Tc† (N)	Tg† (N)	SIZE CODE
	B	G	Tol.	W	Tol.	n	d ~	t	Tol.	D	Tol.	D1 ~	C	C1	b ~			
0160	16	16.8	+0.11 −0.00	1.10		1.3	0.43	1.00		17.3		13.1	11.5	12.4	2,1	7800	1210	0160
0170	17	17.8		1.10		1.3	0.43	1.00		18.3		14.1	12.5	13.4	2.1	8300	1280	0170
0180	18	19.0		1.10		1.6	0.54	1.00		19.5		15.1	13.3	14.4	2.2	8800	1700	0180
0190	19	20.0		1.10		1.6	0.54	1.00		20.5		16.1	14.3	15.4	2.2	9300	1790	0190
0200	20	21.0	+0.15 −0.00	1.10		1.6	0.54	1.00		21.5		16.9	15.1	16.2	2.3	9700	1890	0200
0210	21	22.0		1.10		1.6	0.54	1.00		22.5	+0.42 −0.21	17.7	15.9	17.0	2.4	10200	1980	0210
0220	22	23.0		1.10		1.6	0.54	1.00		23.5		18.7	16.9	18.0	2.4	10700	2070	0220
0240	24	25.2		1.30		2.0	0.65	1.20		25.9		20.3	18.1	19.4	2.8	14000	2710	0240
0250	25	26.2	+0.21 −0.00	1.30		2.0	0.65	1.20		27.1		21.7	18.9	20.2	2.9	14600	2830	0250
0260	26	27.2		1.30		2.0	0.65	1.20		27.9		21.9	19.7	21.0	3.0	15200	2940	0260
0270	27	28.4		1.30		2.3	0.75	1.20		29.1		23.1	20.7	22.2	3.0	15800	3560	0270
0280	28	29.4		1.30		2.3	0.75	1.20	+0.00 −0.06	30.1		23.9	21.5	23.0	3.1	16400	3690	0280
0300	30	31.4		1.30		2.3	0.75	1.20		32.1		25.7	23.3	24.8	3.2	17500	3960	0300
0320	32	33.7		1.30		2.8	0.91	1.20		34.4		27.8	25.1	26.9	3.3	18700	5130	0320
0330	33	34.7		1.30		2.8	0.91	1.20		35.5	+0.50 −0.25	28.9	26.1	27.9	3.3	19300	5290	0330
0350	35	37.0		1.60		3.2	1.06	1.50		37.8		31.0	27.9	30.0	3.4	25600	6600	0350
0360	36	38.0	+0.25 −0.00	1.60	+0.14 −0.00	3.2	1.06	1.50		38.8		31.6	28.5	30.6	3.6	26300	6790	0360
0380	38	40.0		1.60		3.2	1.06	1.50		40.8		33.2	30.1	32.2	3.8	27800	7160	0380
0400	40	42.5		1.85		4.0	1.31	1.75		43.5		35.1	31.0	33.7	4.2	28300	9420	0400
0420	42	44.5		1.85		4.0	1.31	1.75		45.5	+0.78 −0.39	37.1	33.0	35.7	4.2	29700	9900	0420
0450	45	47.5		1.85		4.0	1.31	1.75		48.5		39.7	35.6	38.7	4.4	31800	10600	0450
0470	47	49.5		1.85		4.0	1.31	1.75		50.5		41.1	37.0	39.7	4.7	33300	11100	0470
0480	48	50.5		1.85		4.0	1.33	1.75		51.5		42.1	38.0	40.7	4.7	34000	11300	0480
0500	50	53.0		2.15		4.8	1.58	2.00		54.2		43.8	39.0	42.2	5.2	40500	14100	0500
0520	52	55.0		2.15		4.8	1.58	2.00		56.2		45.8	41.0	44.2	5.2	42000	14700	0520
0550	55	58.0		2.15		4.8	1.58	2.00		59.2		48.8	44.0	47.2	5.2	44500	15500	0550
0570	57	60.0		2.15		4.8	1.58	2.00		61.2	+0.92 −0.46	50.8	46.0	49.2	5.2	46100	16100	0570
0580	58	61.0	+0.30 −0.00	2.15		4.8	1.58	2.00		62.2		51.8	47.0	50.2	5.2	46900	16400	0580
0600	60	63.0		2.15		4.8	1.58	2.00	+0.00 −0.07	64.2		53.8	49.0	52.2	5.2	48500	17000	0600
0620	62	65.0		2.15		4.8	1.58	2.00		66.2		55.8	51.0	54.2	5.2	50200	17500	0620
0650	65	68.0		2.65		4.8	1.58	2.50		69.2		57.8	52.7	56.0	5.7	65700	18400	0650
0670	67	70.0		2.65		4.8	1.58	2.50		71.5		60.1	54.7	58.0	5.7	67800	18900	0670
0680	68	71.0		2.65		4.8	1.58	2.50		72.5		61.1	55.7	59.0	5.7	68800	19200	0680
0720	72	75.0		2.65		4.8	1.58	2.50		76.5		64.5	59.1	62.4	6.0	72800	20400	0720
0800	80	83.5	+0.35 −0.00	2.65		5.5	1.84	2.50		85.5	+1.08 −0.54	73.5	67.1	70.9	6.0	80900	26400	0800
0850	85	88.5		3.15		5.5	1.84	3.00	+0.00 −0.08	90.5		77.3	70.9	74.7	6.6	108300	28000	0850

Standard material - carbon spring steel. Standard finish - phosphate and oil.

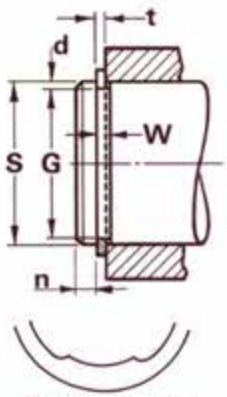
BALANCED LUG CIRCLIPS EUROPEAN SPECIFICATION
M1408

All dimensions in mm



Circlip on shaft

Circlip in groove



Beam configuration on some larger sizes

† Thrust load calculations see pages 9 & 10

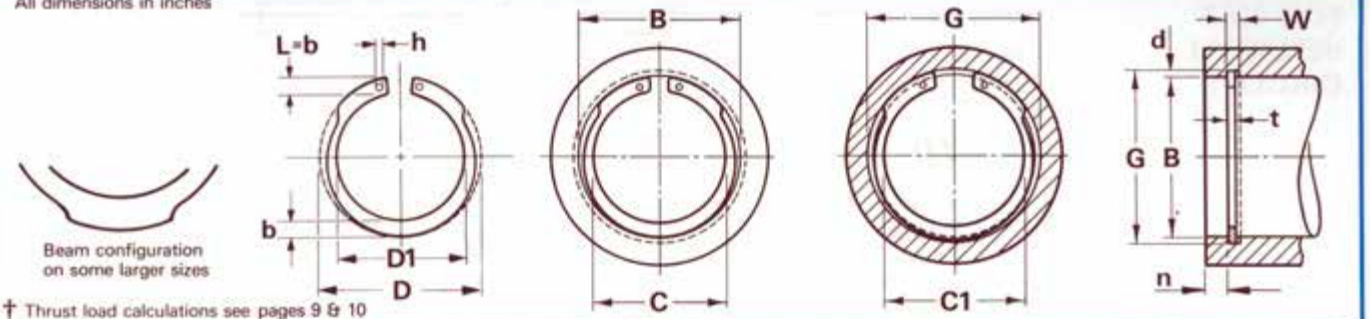
SIZE CODE	Shaft S	Groove (G) G	Tol.	W	Tol.	n.	d ≈	Circlip (F) t	Tol.	D	Tol.	D1 ≈	C	C1	b ≈	Tc† (N)	Tg† (N)	SIZE CODE
0120	12	11.5		1.10		0.9	0.27	1.00		11.0		15.2	16.5	15.9	2.1	5840	565	0120
0130	13	12.4		1.10		1.0	0.32	1.00		11.9		16.1	17.5	16.8	2.1	6330	735	0130
0140	14	13.4	+0.00 −0.11	1.10		1.0	0.32	1.00		12.9	+0.10 −0.35	17.1	18.5	17.8	2.1	6820	790	0140
0150	15	14.3		1.10		1.2	0.37	1.00		13.8		18.6	20.1	19.3	2.4	7300	990	0150
0160	16	15.2		1.10		1.3	0.42	1.00		14.7		19.7	21.3	20.4	2.5	7790	1210	0160
0170	17	16.2		1.10		1.3	0.42	1.00		15.7		20.5	22.1	21.2	2.4	8280	1280	0170
0180	18	17.0		1.30		1.6	0.52	1.20		16.5		21.7	23.5	22.4	2.6	10500	1700	0180
0200	20	19.0	+0.00 −0.15	1.30		1.6	0.53	1.20		18.5	+0.13 −0.42	24.1	25.9	24.8	2.8	11700	1890	0200
0220	22	21.0		1.30		1.6	0.53	1.20		20.5		26.9	28.7	27.6	3.2	12900	2070	0220
0230	23	22.0		1.30		1.6	0.53	1.20		21.5		27.7	29.5	28.4	3.1	13400	2170	0230
0240	24	22.9		1.30		1.8	0.60	1.20		22.2		28.6	30.7	29.5	3.2	14000	2490	0240
0250	25	23.9		1.30		1.8	0.60	1.20	+0.00 −0.06	23.5		30.8	32.7	31.5	3.7	14600	2590	0250
0260	26	24.9	+0.00 −0.21	1.30		1.8	0.60	1.20		24.2	+0.21 −0.42	31.2	33.3	32.1	3.5	15200	2700	0260
0280	28	26.6		1.60		2.3	0.75	1.50		25.9		33.5	35.9	34.4	3.8	20500	3690	0280
0300	30	28.6		1.60		2.3	0.75	1.50		27.9		35.7	38.1	36.6	3.9	21900	3960	0300
0320	32	30.3		1.60		2.8	0.91	1.50		29.6		37.6	40.3	38.5	4.0	23400	5130	0320
0340	34	32.3		1.60		2.8	0.91	1.50		31.5	+0.25 −0.50	38.5	41.3	39.5	3.5	24800	5450	0340
0350	35	33.0		1.60	+0.14 −0.00	3.2	1.06	1.50		32.2		40.6	43.7	41.6	4.2	25600	6600	0350
0400	40	37.5	+0.00 −0.25	1.85		4.0	1.31	1.75		36.5		45.9	50	47.3	4.7	28300	9420	0400
0420	42	39.5		1.85		4.0	1.31	1.75		38.5		47.9	52	49.3	4.7	29700	9900	0420
0450	45	42.5		1.85		4.0	1.31	1.75		41.5	+0.39 −0.78	50.9	55	52.3	4.7	31900	10600	0450
0470	47	44.5		1.85		4.0	1.31	1.75		43.5		53.5	57.6	54.9	5.0	33300	11100	0470
0480	48	45.5		1.85		4.0	1.31	1.75		44.5		54.9	59	56.3	5.2	34000	11300	0480
0500	50	47.0		2.15		4.7	1.56	2.00		45.8		56.2	61	57.8	5.2	40500	14100	0500
0550	55	52.0		2.15		4.8	1.57	2.00		50.8	+0.46 −0.98	62.4	67.2	64.0	5.8	44500	15500	0550
0580	58	55.0		2.15		4.8	1.57	2.00		53.8		65.1	70.2	67.0	5.8	46900	16400	0580
0600	60	57.0		2.15		4.8	1.57	2.00		55.8		67.1	72.2	69.0	5.8	48500	17000	0600
0650	65	62.0	+0.00 −0.30	2.65		4.8	1.57	2.50	+0.00 −0.07	60.8		72.5	77.8	74.6	6.0	65700	18400	0650
0700	70	67.0		2.65		4.8	1.57	2.50		65.5	+0.46 −1.10	78.2	83.8	80.6	6.5	70800	19800	0700
0720	72	69.0		2.65		4.8	1.57	2.50		67.5		80.2	85.8	82.6	6.5	72800	20400	0720
0750	75	72.0		2.65		4.8	1.57	2.50		70.5		83.2	88.8	85.6	6.5	75800	21200	0750
0800	80	76.0		2.65		5.3	1.75	2.50		74.5		88.2	94.8	91.1	7.0	80900	26400	0800
0820	82	78.5		2.65		5.3	1.75	2.50		76.5		90.2	96.8	93.1	7.0	82900	27000	0820
0850	85	81.5		3.15		5.3	1.75	3.00		79.5		94.0	100.6	96.9	7.4	103000	28000	0850
0870	87	83.5	+0.00 −0.35	3.15	+0.18 −0.00	5.3	1.75	3.00	+0.00 −0.08	81.5	+0.54 −1.30	96.0	102.6	98.9	7.4	106000	28700	0870
0900	90	86.5		3.15		5.3	1.75	3.00		84.5		99.0	105.6	101.9	7.4	109000	29700	0900
0950	95	91.5		3.15		5.3	1.75	3.00		89.5		105.0	111.8	108.1	8.0	115000	31300	0950
1000	100	96.5		3.15		5.3	1.75	3.00		94.5		110.0	116.8	113.1	8.0	121000	33000	1000

Standard material - carbon spring steel. Standard finish - phosphate and oil.

BALANCED LUG CIRCLIPS AMERICAN SPECIFICATION
N1308

Equivalent to MIL-R-21248/MS 16627

All dimensions in inches



† Thrust load calculations see pages 9 & 10

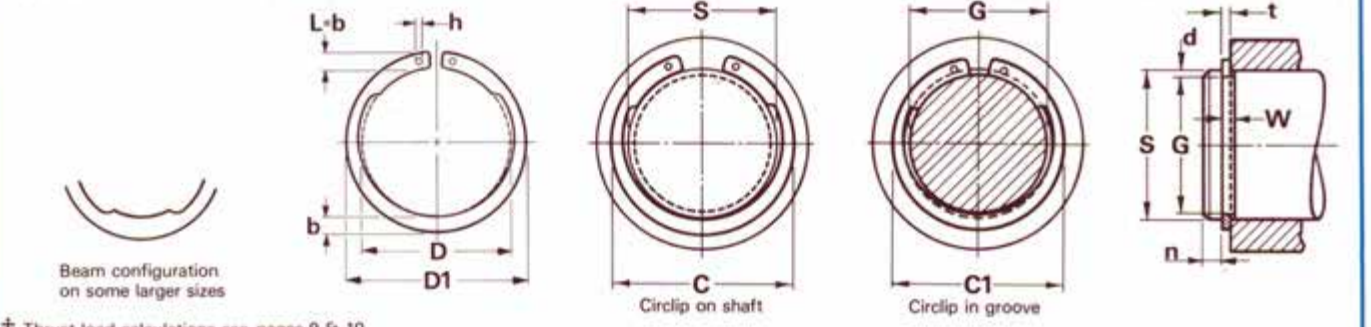
SIZE CODE	Bore (B)		Groove (G)						Circlip (F)										Tc†	Tg†
	B		G	Tol	W	Tol	n	d	t	Tol	D	Tol	D1	C	C1	L	b	h	(lb.f)	(lb.f)
	(frac)	(dec)					(min)	~								(max)	~	(min)		
0062	5/8	.625	.665	± .002	.029		.060	.020	.025		.675		.54	.47	.51	.076	.072	.028	1100	353
0075	3/4	.750	.796		.039		.070	.023	.035		.808		.63	.56	.61	.089	.085	.040	1850	201
0081	13/16	.812	.862	± .003	.046	+ .003	.075	.025	.042		.877	+ .010	.69	.61	.66	.097	.092	.040	2410	574
0087	7/8	.875	.931		.046	− .000	.085	.028	.042		.944	− .005	.75	.66	.72	.104	.099	.040	2600	693
0093	15/16	.938	1.000		.046		.095	.031	.042		1.015		.81	.70	.77	.111	.106	.040	2780	820
0100	1	1.000	1.066		.046		.100	.033	.042		1.081		.85	.75	.83	.118	.113	.040	2970	933
0106	1.1/16	1.062	1.130		.056		.100	.034	.050		1.150		.91	.80	.87	.126	.120	.048	3750	1020
0112	1.1/8	1.125	1.197		.056		.110	.036	.050	± .002	1.217		.97	.85	.93	.129	.123	.048	3980	1140
0118	1.3/16	1.188	1.262		.056		.110	.037	.050		1.283		1.03	.91	.99	.132	.126	.048	4200	1240
0125	1.1/4	1.250	1.330	± .004	.056	+ .004	.120	.040	.050		1.351	+ .015	1.10	.96	1.06	.135	.129	.048	4410	1410
0131	1.5/16	1.312	1.396		.056	− .000	.125	.042	.050		1.418	− .010	1.15	1.02	1.12	.138	.132	.048	4640	1560
0137	1.3/8	1.375	1.461		.056		.130	.043	.050		1.486		1.22	1.08	1.17	.141	.135	.048	4860	1670
0143	1.7/16	1.438	1.528		.056		.135	.045	.050		1.552		1.26	1.13	1.24	.150	.144	.074	5080	1830
0150	1.1/2	1.500	1.594		.056		.140	.047	.050		1.622		1.32	1.18	1.28	.154	.148	.074	5300	1990
0156	1.9/16	1.562	1.658		.068		.145	.048	.062	± .003	1.688	+ .020 − .013	1.37	1.22	1.32	.165	.158	.074	5700	2120

Standard material - carbon spring steel. Standard finish - phosphate and oil.

BALANCED LUG CIRCLIPS AMERICAN SPECIFICATION
N1408

Equivalent to MIL-R-21248/MS 16626

All dimensions in inches



† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft (S)		Groove (G)						Circlip (F)										Tc†	Tg†
	S		G	Tol	W	Tol	n	d	t	Tol	D	Tol	D1	C	C1	L	b	h	(lb.f)	(lb.f)
	(frac)	(dec)					(min)	~								(max)	~	(min)		
0050	1/2	.500	.468	± .002	.039		.050	.016	.035		.461		.62	.67	.64	.084	.080	.040	1240	226
0056	9/16	.562	.530		.039		.050	.016	.035		.521		.70	.75	.72	.092	.088	.040	1390	254
0059	19/32	.594	.559		.039		.050	.017	.035		.550		.73	.79	.75	.096	.092	.040	1470	294
0062	5/8	.625	.588		.039		.055	.018	.035		.579		.78	.83	.79	.100	.096	.040	1550	327
0068	11/16	.688	.646		.046	+ .003	.065	.021	.042		.635	+ .005	.84	.91	.87	.109	.104	.040	2040	409
0075	3/4	.750	.704	± .003	.046	− .000	.070	.023	.042		.693	− .010	.92	.99	.94	.117	.112	.040	2230	488
0078	25/32	.781	.733		.046		.075	.024	.042		.722		.95	1.04	.98	.121	.116	.040	2320	530
0081	13/16	.812	.762		.046		.075	.025	.042		.751		.99	1.08	1.02	.125	.120	.048	2410	574
0087	7/8	.875	.812		.046		.080	.027	.042		.810		1.07	1.16	1.08	.133	.128	.048	2600	668
0093	15/16	.938	.882		.046		.085	.028	.042	± .002	.867		1.14	1.24	1.18	.141	.136	.048	2780	743
0100	1	1.000	.940		.046		.090	.030	.042		.925		1.21	1.32	1.24	.149	.144	.048	2970	848
0106	1.1/16	1.062	.998		.056		.096	.032	.050		.982		1.28	1.38	1.31	.153	.147	.076	3750	961
0112	1.1/8	1.125	1.059		.056		.100	.033	.050		1.041		1.34	1.45	1.38	.156	.150	.076	3980	1050
0118	1.3/16	1.188	1.118		.056		.105	.035	.050		1.098		1.40	1.52	1.44	.159	.153	.076	4200	1180
0125	1.1/4	1.250	1.176	± .004	.056	+ .004	.110	.037	.050		1.156	+ .010	1.47	1.59	1.51	.163	.157	.076	4420	1310
0131	1.5/16	1.312	1.232		.056	− .000	.120	.040	.050		1.214	− .015	1.54	1.66	1.57	.167	.161	.076	4640	1480
0137	1.3/8	1.375	1.291		.056		.125	.042	.050		1.272		1.60	1.73	1.64	.171	.165	.076	4860	1630
0143	1.7/16	1.438	1.350		.056		.130	.044	.050		1.333		1.67	1.80	1.70	.175	.169	.076	5080	1790
0150	1.1/2	1.500	1.406		.056		.140	.047	.050		1.387		1.73	1.87	1.77	.179	.173	.076	5940	1990

Standard material - carbon spring steel. Standard finish - phosphate and oil.

FOR 1300 INTERNAL CIRCLIPS

PlierType	Circlip Sizes (mm)
Mini Internal	8
ISS & IBS	14 - 63
ISL & IBL	63 - 82
HC1 & HD1	8 - 17
HC2 & HD2	18 - 62
HC3 & HD3	63 - 95
HC4 & HD4	85 - 140
Major Internal	105 - 300
Super Major Internal	260 Upwards

Plier Type	American Circlip Sizes
Mini Internal	25 - 31
ISS	62 - 250
ISL	256 - 347
Major Internal	350 - 950
Super Major Internal	625 Upwards

FOR 1400 EXTERNAL CIRCLIPS

Plier Type	Circlip Sizes (mm)
Mini A External	3
Mini B External	4 - 5
Mini C External	6 - 9
ESS & EBS	13 - 63
ESL & EBL	65 - 82
HA0	6 - 11
HA1 & HB1	10 - 22
HA2 & HB2	20 - 35
HA3 & HB3	36 - 102
HA4 & HB4	85 - 140
Major External	90 - 305
Super Major External	260 Upwards

Plier Type	American Circlip Sizes
Mini A External	12 - 23
Mini B External	25 - 35
ESS & EBS	93 - 250
ESL & EBL	255 - 343
Major External	275 - 975
Super Major External	675 Upwards